MACHINERY

DESIGN — CONSTRUCTION — OPERATION

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PRINCIPAL ARTICLES IN THIS NUMBER

FOR COMPLETE CLASSIFIED CONTENTS, SEE PAGE 496-D

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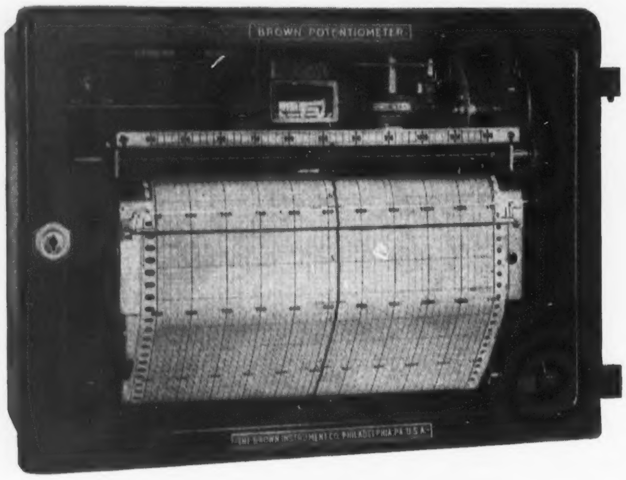

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MACHINERY

Volume 39 NEW YORK, MARCH, 1933 Number 7

Half a Million Inches of Welding a Week

Welding is Becoming More and More an Important Factor in Large-Scale Manufacture

By CHARLES O. HERB

TWO of the objectives set by the engineers of the General Electric Co. in planning the manufacture of domestic oil-burning units, recently placed on the market, were to eliminate leakage of water and to prevent the escape of steam or oil fumes. In order to meet these requirements, a one-piece, all-welded steel construction was adopted for the furnace proper, which comprises the combustion chamber, boiler, water tubes, tube drum, smoke pipe, and all other important parts of the equipment, except the oil-burning unit and its control.

The furnaces are shaped from flat steel and welded complete in a shop fitted out for this work at the

Pittsfield, Mass., plant of the company. Each furnace has approximately 2100 inches of welded joints. With a production of 225 furnaces a week, this means that almost half a million inches of welding are accomplished in that time, or about 1 1/2 miles of welding a day. The welding force, with the production given, averages 125 men.

Scrap Metal Has Been Practically Eliminated by the Methods Employed

The furnaces are constructed throughout of 1/4-inch firebox steel. The sheet material is delivered to a department equipped with large bending rolls, shears, a press brake, and several double-crank power presses, including one of 600 tons capacity. Here the sheets are cut to size, notched to form the required openings, bent where notched to form the side walls of the openings, and rolled to the specified radii.

The various sections, such as the combustion chamber, outer boiler casing, tube drums and water tubes, are first welded separately and then welded together into one unit. Of the entire furnace, only the steam dome is a casting, and this is attached to the boiler by welding. The outer boiler casing is made in two pieces which are securely joined by welding during the assembly. This casing is held the required distance from the combustion chamber by staybolts that are welded in place.

One of the features of the manufacturing methods followed is the small amount of scrap produced. Pieces of metal sheared from the sheets that make up the larger sections are used to complete the walls of openings and to produce the smaller parts.

Forty-Five Per Cent of the Welding is Done by Machines

From 40 to 45 per cent of the welding is done automatically or semi-automatically, and the rest by hand. Atomic-hydrogen welding is performed on the more important internal joints, because the flow of metal obtained by this process insures leak-proof welds the first time at points that would be difficult to correct in case a leak showed up when placed in the water test. Also, the process is particularly desirable in places where the melted metal would tend to run from the joint if the regular arc-welding process were employed. As is well known, in the atomic-hydrogen process, hydrogen envelops the electrode and melted metal, and protects the weld from oxidation. A tungsten-steel electrode wire is used in the operations described.

Fig. 1. Automatic Machines Have Played a Large Part in Adapting Welding to Quantity Production Manufacture—This is an Automatic Atomic-hydrogen Welder

Fig. 2. Atomic-hydrogen Welding is Employed Both Automatically and by Hand, Particularly for Inside Seams

Fig. 3. One of the Final Operations on the Combustion Chamber before the Boiler Shell is Welded around it

Fig. 4. The Furnace Nears Completion, the Boiler Shell Having Been Welded around the Combustion Chamber

Fig. 5. Welding the Steam Outlet—a Steel Casting—to the Boiler Shell. All Other Parts are Made of Steel Plate

Fig. 6. A Single Week's Production of All-Welded Oil-burner Furnaces

Fig. 1 shows an automatic atomic-hydrogen welding machine used for welding the main seam of the combustion chamber. The 1/4-inch steel plate is joined at a high rate of speed. Eight air-operated clamps hold the work securely for the operation and permit quick reloading.

When the combustion chamber has been built up, all openings are sealed tight and then the inside is filled with water under a pressure of 60 pounds per square inch. If leakage appears, no matter how slight, the part is rejected. The outer boiler casing must undergo a similar inspection, while the water tubes are subjected to a test in which the water is under a pressure of 120 pounds per square inch.

When the furnace is assembled, asbestos insulation is placed around the outer boiler casing, together with an attractively enamelled jacket. Chromium-plated fittings are used.

Effect of Adding Nickel to Nitriding Steels

Up to the present time, nickel has not been an essential constituent of steels used for nitriding, and as a rule, its use has so far been avoided. However, it was pointed out in a paper presented at a meeting of the American Society for Steel Treating that nickel serves a useful purpose in these steels. According to the results of research conducted by Professor Homerberg, of the Massachusetts Institute of Technology, and H. J. French, of the International Nickel Co., the principal benefits derived from the addition of nickel lie in the strengthening and toughening of the nitrided case; the strengthening and hardening of the core, by means of which better support is provided to the case; and the development of dispersion hardening phenomena in steels containing appreciable proportions of aluminum, which results in an increase in core strength and in the elastic properties.

Thus, nickel can be added in varying proportions to nitriding steels to control the relative toughness and hardness of the case and core and to provide a wide range of properties to meet varied service requirements. The new developments are expected to extend the useful applications of nitriding steels.

How to Obtain Best Results in Roll-Grinding

Third of a Series of Five Articles Giving Complete Directions for Roll-Grinding Operations and Wheel Selection

By H. J. WILLS, Engineer
The Carborundum Co., Niagara Falls, N. Y.

THE second article in this series, published on page 374 of February MACHINERY, dealt mainly with points to be taken into account in selecting wheels and with factors affecting good grinding. The present installment will deal specifically with the grinding of steel rolls, chilled iron rolls, jewelers' rolls, chromium-plated rolls, and paper-mill rolls.

Hardened steel rolls usually require a higher grade of grinding than chilled iron rolls. Hence it is necessary to use a greater range of grit sizes, frequently from 50 for roughing, through 80, 150, 320, 500, and even "ultra-finish." These wheels should all be manipulated as both roughing and finishing wheels, regardless of how many wheels are to be used subsequently.

With the exception of roughing wheels for building up surfaces from the black, only fine-grit wheels should be used. This applies particularly to refinishing or reconditioning, where only a few thousandths of an inch of stock has to be removed. When coarse wheels are used for rapid stock removal, the surface is proportionately rough and much time is lost in smoothing with finer wheels. Properly used, a fine-grit wheel will save time in roll refinishing.

As stated, all wheels should be used as both roughing and finishing wheels; that is, as much stock should be removed at a rapid traverse, after an open dressing, as the grit will warrant. The wheel should be redressed at slow traverse (1 to 2 inches per minute) allowing the cut to die out; then the wheel edges should be rounded off, and grinding should be done at minimum traverse, maximum vibrationless work speed, and reduced wheel speed, allowing the wheel to spark out. This procedure will generate good surfaces and allow greater grit gaps than would be possible if the wheels were not "finished out."

Table 1. Data on Grinding Hardened Steel Rolls, with Operations Arranged in Consecutive Order from the Roughing to the Super-Finishing

Wheel Number	Grit Number of Wheel	Number and Type of Operation	Wheel Speed, Surface Feet per Minute	Rate of Traverse	Depth of Cut	Method of Dressing Wheel	Number of Passes of Wheel
1	50	1 Roughing	5500	Maximum	Maximum	Open	As required
	50	2	4000	Intermediate	Minimum	Smooth	2
	50	3	4000	Minimum	None	None	3
2	80	1 Smoothing	5500	Maximum	Maximum	Open	1–2
	80	2	4000	Intermediate	Minimum	Smooth	2
	80	3	4000	Minimum	None	None	4
3	150–180	1 Semi-finish and Redressing	5000	Maximum	Maximum	Open	2
	150–180	2	4000	Intermediate	Minimum	Smooth	3
	150–180	3	4000	Minimum	Minimum	Fine	1
	150–180	4	4000	Minimum	None	None	4
4	320–FF	1 Finishing and Refinishing	4000	Maximum	Minimum	Smooth	3
	320–FF	2	4000	Intermediate	Minimum	Fine	3
	320–FF	3	4000	Minimum	None	None	4
5	500	1 Ultra-finishing	4000	Intermediate	Minimum	Fine	3
	500	2	4000	Minimum	None	None	4–6
6	Ultra-fine	1 Super-finishing	2500	Intermediate	Minimum	Fine	4
	Ultra-fine	2	3000	Minimum	None	None	4

When the operation is simply refinishing, semi-finish and finish wheels only should be used.

Grinding Chilled Iron Rolls

Chilled iron rolls are best ground with silicon-carbide wheels in such bonds as are suited to the grinding machine. The grit range is largely dependent on the class of work for which the rolls are to be used. Generally speaking, 24- to 36-grit wheels are used for roughing out, and 60- or 70-grit wheels for finishing and refinishing. In a few instances, 100- to 150-grit wheels are employed. With this grit range, it is advisable to utilize special bonds to avoid scratching.

Wheels are maintained at the recommended

Table 2. Data on Grinding Chilled Iron Rolls, with Operations Arranged in Consecutive Order from the Roughing to the Finishing

Wheel Number	Grit Number of Wheel	Number and Type of Operation	Wheel Speed, Surface Feet per Minute	Rate of Traverse	Depth of Cut	Method of Dressing Wheel	Number of Passes of Wheel
1	30–36	1 Roughing	5500	Maximum	Maximum	Open	As required
	30–36	2 Roughing	5500	Intermediate	Minimum	Smooth	3
	30–36	3 Roughing	4000	Minimum	None	None	4
2	60–80	1 Finishing	5500	Maximum	Maximum	Open	As required
	60–80	2 Finishing	4000	Intermediate	Minimum	Smooth	3
	60–80	3 Finishing	4000	Minimum	None	None	4

speeds, except for final-finishing passes, when it is advantageous to reduce the speed to 60 per cent of the rating. When satin finishes are desired, the work should be operated in the same "leaving" direction as the wheel, or the work should be rotated and the wheel allowed to roll on the work surface in the same manner as a knurling tool.

The Grinding of Jewelers' Rolls

The grinding of jewelers' rolls is a distinct class of grinding, inasmuch as these rolls are comparatively small in size and require the highest surface perfection, dimensional accuracy, and polish. These rigid requirements, however, are relatively easy of attainment, as the class of work itself inspires constant and accurate machine maintenance and the employment of highly skilled operators. Surface and finish being paramount, the necessary time and care are given to the work.

Allowing for the closer tolerances of jewelers' rolls, the same grinding practice and procedure already outlined is followed. Frequently, lapping or hand-polishing is resorted to as a final operation, but if the grinding is properly done, this operation is unnecessary.

The most popular wheel sizes for grinding jewelers' rolls are from 8 to 12 inches in diameter, and from 1/2 to 1 inch width of face. It is very important that the wheel edges be well rounded to avoid troublesome traverse marks and gouges from chipped edges. In selecting wheels, allowance should be made on the wheel width for these rounded edges, as, obviously, a radius of 1/16 to 1/8 inch on the edges of a 1/2- or 5/8-inch face would not be good practice.

It is further recommended that the final or "ultra-finish" wheels be of somewhat smaller diameter than the preceding wheels, since small arcs of contact are desirable on these extremely fine wheels.

By careful wheel manipulation, very good results can be obtained with wheels 1, 3, and 4, or 2 and 4 in Table 3. For best results, however, wheels 2, 3, and 4 should be used, wheel 1 being used for roughing only. Frequently, regrinding can be accomplished with wheels 3 and 4 only.

Grinding Chromium-Plated Rolls

Chromium-plated rolls present several new factors in roll-grinding. Chromium plate has a great variation in hardness, porosity, and depth of deposit, all of which vitally affect the grinding practice. These variables are not so pronounced when the plating is all done in one plant, but even then it may require considerable experimentation to select wheels of the best grit, grade, and bond.

Generally speaking, an aluminum-oxide wheel is

Table 3. Data on Grinding Jewelers' Rolls, with Operations Arranged in Consecutive Order from the Roughing to the Ultra-Finishing

Wheel Number	Grit Number of Wheel	Number and Type of Operation	Wheel Speed, Surface Feet per Minute	Rate of Traverse	Depth of Cut	Method of Dressing Wheel
1	60–80	1 Roughing	5500	Maximum	Maximum	Open
		2 Roughing	4000	Intermediate	Minimum	Smooth
		3 Roughing	4000	Minimum	None	None
2	150–180	1 Smoothing	5500	Maximum	Maximum	Open
		2 Smoothing	4000	Intermediate	Minimum	Smooth
		3 Smoothing	4000	Minimum	None	None
3	320–FF	1 Semi-finishing	4000	Maximum	Intermediate	Smooth
		2 Semi-finishing	4000	Minimum	Minimum	Smooth
		3 Semi-finishing	4000	Minimum	None	None
4	Ultra-fine	1 Ultra-finishing	3000	Maximum	Maximum	Open
		2 Ultra-finishing	3000	Intermediate	Minimum	Smooth
		3 Ultra-finishing	3000	Minimum	None	None

preferable to a silicon-carbide wheel for grinding chromium-plated rolls, but in using this type of abrasive some caution is required to avoid heating the wheel and work. For this reason, light feeds are used with a soft grade of wheel to offset the effect on the grading, due to light cuts. For the same reason, the supply of coolant must be generous, and, of course, clean.

Regardless of the amount of stock to be removed, the grit selection should be well within the fine range, with a bond peculiarly suited to this work. Owing to the hardness of the chromium skin, the grit penetration is decidedly limited. If more numerous cutting points are presented to the work, each having a definite penetration, the cutting action is increased and a better finish is obtained than if coarser grits are utilized.

Prior to plating, the roll should be very carefully ground, since plating does not improve the quality of surface and this surface is generally permanent.

The work speed should be fairly fast, but controlled by its effect on the wheel grading. The wheel speed can be increased over that shown in Table 4 if vibration is not introduced and the grading will permit. Increased wheel speeds can also be employed to add "finish" in the final passes.

Grinding Paper-Mill Rolls

The grinding of rolls used in the paper-making industry involves considerable accuracy; but, generally speaking, the requirements for surface and finish are not so exacting as in the metallic rolling fields. Paper-mill rolls must be round and parallel, and free from chatter or traverse marks. When they are ground concave or convex, the camber must be as perfect as it is mechanically possible to produce it.

A grinding problem peculiar to the paper-making industry is that of roll sag and roll vibration in the grinder, due largely to the great roll lengths and small diameters involved. Roll sag results in a concave roll body, while roll vibration produces chatter marks and roll whipping, causing the bodies to become oval shaped. Frequently, these faults lead to the erroneous conclusion that the grinding wheel is too hard in grading, and softer wheels are resorted to, with slight improvement, but at the cost of greater wheel consumption.

Supports for the Rolls

To avoid roll sag and vibration, the mounting of the rolls is of first importance. There are many good arguments in favor of both two- and three-point neck-rests for paper-mill rolls, but close observation of both methods will indicate that the two-point support is less inclined to chatter, inasmuch as it is a delicate matter to obtain an even distribution of the load on three points. However, with either arrangement of rests, it is strongly recommended that a hold-down clamp be used on the top of the roll to resist its tendency to creep. It is essential that the lubrication of the rests be even and adequate, as uneven or spasmodic lubrication is fatal to good cylindrical grinding, since a variation of friction on the roll supports causes the roll to assume varying axes, due to its inclination to creep.

For reasons already mentioned, it is obvious that the speeds at which the rolls are driven cannot be so high as might be desirable. They must be held to a lower speed to reduce the tendency to whipping and vibration. The speeds are largely dependent on the ratio of roll cross-section to roll length, and somewhat on the wheel grading.

Table 4. Data on Grinding Chromium-Plated Rolls, with Operations Arranged in Consecutive Order from the Roughing to the Finishing

Wheel Number	Grit Number of Wheel	Number and Type of Operation	Wheel Speed, Surface Feet per Minute	Rate of Traverse	Depth of Cut	Method of Dressing Wheel	Number of Passes of Wheel
1	120–150 120–150	1 } Roughing 2	4000 4000	Maximum Minimum	Minimum None	Open None	As required 3
2	Ultra-fine	1 } Finishing 2	4000 4000	Maximum Minimum	Minimum None	Open None	3 3

Wheel Selection for Paper-Mill Rolls

The roll grinders most frequently used for paper-mill rolls are of the type requiring shellac-bonded wheels. There are, however, many grinders in use on which vitrified wheels are employed to better advantage.

Users of shellac-bonded wheels should bear in mind that these wheels are somewhat affected in grading by prolonged storage, becoming softer as they increase in age. For this reason, this class of wheel should either be chosen from stock sizes, grits, and grades, or ordered in quantities that will insure storage until seasoned. These wheels also may be affected by strong alkali coolants which have a tendency to disintegrate the bond, causing loosening of the grains, with resultant scratches or "fish-tails" on the roll.

The surface requirements of paper-mill rolls are such that a one-wheel operation is usually sufficient. Taken individually, rolls of chilled iron, rubber, paper, brass, copper, and granite could be ground

to a better degree of surface perfection and economy by wheels of different characteristics; but the fact that cast-iron rolls represent approximately 50 per cent of all rolls ground and, further, that the wheels best suited for cast iron can also be used on all other paper-mill rolls, a single wheel would seem the most economical. The time required to change wheels is another factor in favor of a single wheel.

The fourth installment of this series of articles, to be published in April MACHINERY, will give specific directions for the grinding of rubber rolls, both soft and hard; steckel-mill rolls; foil rolls; and copper rolls for intaglio printing.

* * *

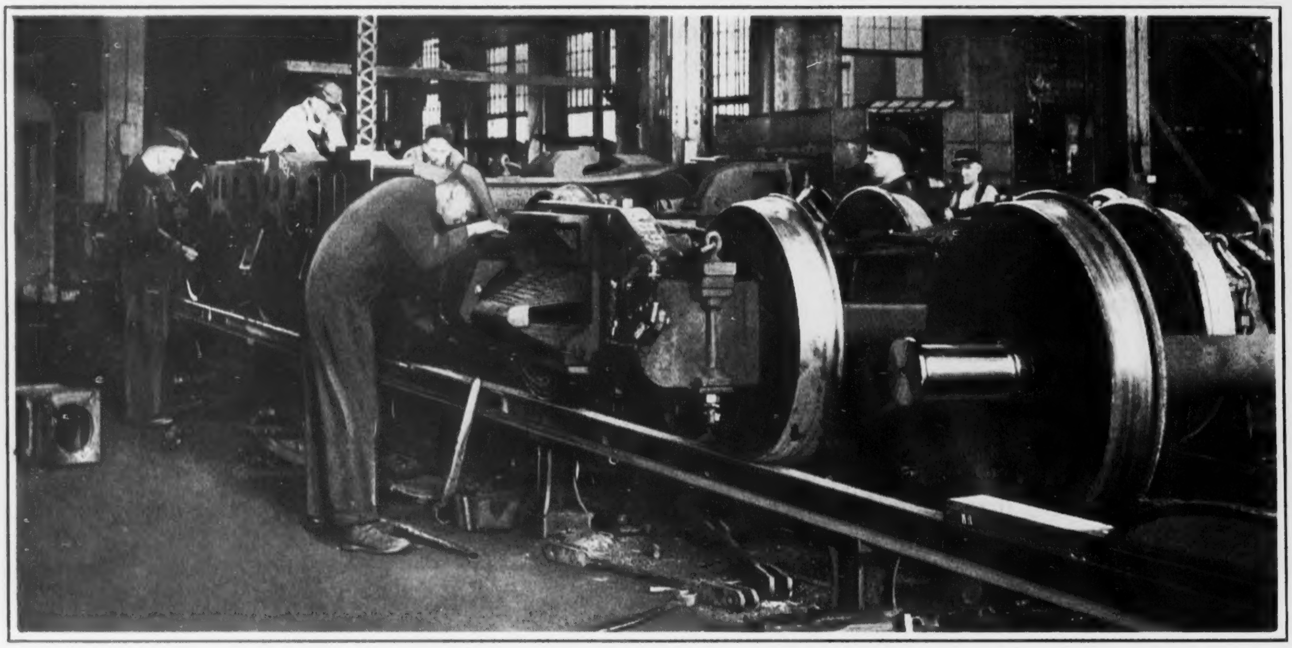
The increasing demand for special alloy-steel castings in relatively small tonnages has resulted in the installation of a great many electric furnaces during the last ten years. These furnaces are very well adapted for such work from both the technical and economical standpoints. According to a paper presented before a recent meeting of the American Society of Mechanical Engineers, by R. A. Bull, Director, Electric Steel Founders' Research Group, more than half of perhaps 280 plants in the United States producing steel castings have installed one or more electric-arc furnaces.

While special steel in small quantities can be produced in converter and crucible-furnace units, the latter types are now infrequently used, largely, but not wholly, for reasons of economy. It should not be inferred, however, that steel-casting manufacture is not satisfactorily carried on in plants equipped with an open-hearth or other forms of melting units. The condition favoring the electric furnace is one of restricted heat size, associated with small individual consumer demand.

Raised Tracks Facilitate Truck Repairs

In most railroad shops, locomotive trailer and tender trucks are dismantled for repairs while standing on tracks that are on a level with the shop floor. A pit below the tracks enables parts to be removed from the under side of the trucks. Thus, when the men are working on the trucks from the floor, they have a back-breaking job, because they must constantly stoop for the removal or assembly of parts, and when they are in the pit, they generally work in semi-darkness.

These disadvantages have been avoided in the Stratford, Ontario, shops of the Canadian National Railways. Trucks to be repaired in this shop are lifted by cranes to raised tracks, such as shown in the illustration. These tracks are about 20 inches above the floor. Consequently, the men can work on the trucks from above or below with ease and with plenty of light. The raised tracks consist of standard rails mounted on cast-iron pedestals.



Raised Tracks Permit Truck Repairs to be Made More Easily, and with Adequate Light from Underneath

* * *

The imports of the Soviet Union from the United States during the first eight months of 1932 were valued at $10,800,000 as against $90,000,000 in the same period of 1931 and $108,000,000 in 1930. Germany exported to the Soviet Union to the value of $120,000,000 during the first eight months of 1932 as compared with $122,000,000 in 1931 and $79,000,000 in 1930. The British trade during the same period of 1932 amounted to $34,000,000 as compared with $23,000,000 in 1931 and $27,000,000 in 1930. It is obvious that the United States is losing out in its trade with the Soviet Union.

COMPOSITION OF TYPICAL DIE-CASTING ALLOYS

Metals Used in Alloys	Composition of Tin-base Alloys, Per Cent				Composition of Lead-base Alloys, Per Cent				Composition of Zinc-base Alloys,* Per Cent	Composition of Aluminum-base Alloys, Per Cent		Composition of Copper-base Alloys, Per Cent
	No. 1	No. 2	No. 3	No. 4	No. 1	No. 2	No. 3	No. 4		Aluminum-copper Alloys	Aluminum-silicon Alloys	
Copper	4.50	6.00	7.75	3.00	..	..	..	..	2.5–3.5	7.0–9.0	0.60 max.	57–59
Antimony	4.50	8.00	7.75	10.50	5	10	17	15	......	....	....	....
Lead	....	....	1.75	25.00	95	90	83	80	0.010 max.	....	....	0.75 max.
Tin	90.00	86.00	83.75	61.50	..	..	..	5	0.005 max.	....	....	0.50–1.50
Aluminum	.....	.....	.....	.....	..	..	..	..	3.5–4.5	Remainder	Remainder	0.10 max.
Magnesium	.....	.....	.....	.....	..	..	..	..	0.02–0.10	....	....	....
Iron	.....	.....	.....	.....	..	..	..	..	0.100 max.	2.50 max.	2.00 max.	....
Cadmium	.....	.....	.....	.....	..	..	..	..	0.005 max.	....	....	....
Zinc	.....	.....	.....	.....	..	..	..	..	Remainder	....	....	40–42
Silicon	.....	.....	.....	.....	..	..	..	..	......	1.0–3.0	11.50–12.50	....
Manganese	.....	.....	.....	.....	..	..	..	..	......	....	....	0.25 max.
Impurities	.....	.....	.....	.....	..	..	..	..	0.020 max.	1.50	1.50 max.	....

Data Pertaining to Die-Castings Made from Typical Die-casting Alloys

Factors Considered in Die-casting Design	Tin-base Alloys	Lead-base Alloys	Zinc-base Alloys	Aluminum-base Alloys	Copper-base Alloys
Maximum weight of casting, pounds	10	15	24	10	3
Maximum wall thickness, large castings, inch	1/16	1/16	1/16	0.085	0.125
Maximum wall thickness, small castings, inch	1/32	1/32	0.035	0.050	0.050
Variation from drawing dimensions per inch, inch	0.001	0.001	0.001	0.002	0.003
Minimum number of external cast threads per inch	32	32	24	20	10
Minimum number of internal cast threads per inch	32	32	24	none	none
Minimum diameter of cast holes, inch	0.031	0.031	0.031	3/32	3/16
Draft per inch of length of cores, inch	none	none	0.003	0.015	0.020
Draft per inch of length or diam. of side walls, inch	0.0005	0.0005	0.005	0.010	0.020

*Zinc used is 99.99+ per cent grade

MACHINERY'S Data Sheet No. 245, New Series, March, 1933

Based on a paper read before the American Society of Mechanical Engineers by Louis H. Morin, Chief Engineer, Doehler Die Casting Co.

PHYSICAL PROPERTIES AND APPLICATIONS OF DIE-CASTING ALLOYS

The alloys used in modern die-casting practice are classified in five main groups. The compositions of typical alloys representing these groups are given in Data Sheet No. 245, and their general properties and typical applications are given in the following:

1. *Tin-base Alloys*—The No. 1 alloy in this group corresponds to the S A E Specification for No. 10 babbitt. It is used for main-shaft and connecting-rod bearings in the automotive and aircraft industries. The No. 2 alloy is also used for bearings and for other applications requiring a high-class tin-base alloy. This alloy fulfills the S A E Specification No. 11. The No. 3 alloy is a special automotive bearing composition. The No. 4 (S A E No. 12) is of lower cost than the others, because of the lead content. Tin-base alloys are used for automotive bearings and in cases where resistance against the action of acids, alkalis, and moisture is necessary.

2. *Lead-base Alloys*—The lead-base alloys are usually employed where a cheap non-corrosive metal is required and where strength, hardness, and other mechanical properties are unimportant.

3. *Zinc-base Alloys*—The standard zinc-base die-casting alloy having the composition given in Data Sheet No. 245 is widely used in the automotive industry for carburetors, fuel pumps, speedometer housings, brackets, and exterior hardware. It is also used for many household appliances. Practically any type of commercial finish can be applied to zinc die-castings. They can be electroplated or coated with paints, varnishes, lacquers, and enamels. This alloy has the following physical properties:

Tensile strength, lbs. per sq. in.	45,000 to 48,000
Elongation, per cent in 2 inches	4 to 6
Compression strength, lbs. per sq. inch	90,000
Shearing strength, lbs. per sq. inch	45,000
Thermal expansion, inches per in. per deg. F.	0.0000155
Brinell hardness	85 to 90
Weight, lbs. per cubic inch	0.243
Melting point, degrees F.	740
Casting temperature, degrees F.	800

4. *Aluminum-base Alloys*—Although there are an unlimited number of aluminum-base compositions, those used in die-casting are limited practically to two groups—namely, (a) aluminum-copper alloys in which the copper may be varied from 4 to 14 per cent, and (b) aluminum-silicon alloys, with silicon content ranging from 5 to 13 per cent. The typical aluminum-copper alloy having the composition given in Data Sheet No. 245 has the following physical properties:

Tensile strength, lbs. per sq. in.	29,000 to 31,000
Elongation, per cent in 2 inches	1 to 2
Yield point, lbs. per sq. inch	12,000 to 15,000
Brinell hardness	75 to 80

The typical aluminum-silicon alloy, the composition of which is also given in the Data Sheet referred to, has the following physical properties:

Tensile strength, lbs. per sq. inch	30,000 to 33,000
Elongation, per cent in 2 inches	1½ to 3
Yield point, lbs. per sq. inch	10,000 to 12,000
Brinell hardness	70 to 75

Because of their lightness, strength, corrosion resistance, and ability to take and hold a high polish, aluminum die-castings are used for many parts found in vacuum cleaners, cooking utensils, typewriters and similar equipment.

5. *Copper-base Alloys*—Copper-base alloys of the composition given in Data Sheet No. 245, when pressure die-cast, have the following physical properties:

Tensile strength, lbs. per sq. in.	65,000 to 75,000
Yield point, lbs. per sq. inch	35,000 to 40,000
Elongation, per cent in 2 inches	15 to 20
Reduction of area, per cent	15 to 20
Brinell hardness	130 to 140
Weight, lbs. per cubic in.	0.303

The copper-silicon-zinc alloy *"Brastil"* developed by the Doehler Die Casting Co., which has a minimum of 81 per cent copper, possesses the following physical properties:

Tensile strength, lbs. per sq. in.	90,000 to 95,000
Yield point, lbs. per sq. in.	68,000 to 78,000
Elongation, per cent in 2 inches	10 to 17
Reduction of area, per cent	10 to 15
Brinell hardness	160 to 180

This alloy is highly resistant to corrosion, has good wearing qualities, and is easily machined.

MACHINERY'S Data Sheet No. 246, New Series, March, 1933

Based on a paper read before the American Society of Mechanical Engineers by Louis H. Morin, Chief Engineer, Doehler Die Casting Co.

Simple Method of Drawing Intricate Parts in Different Angular Positions

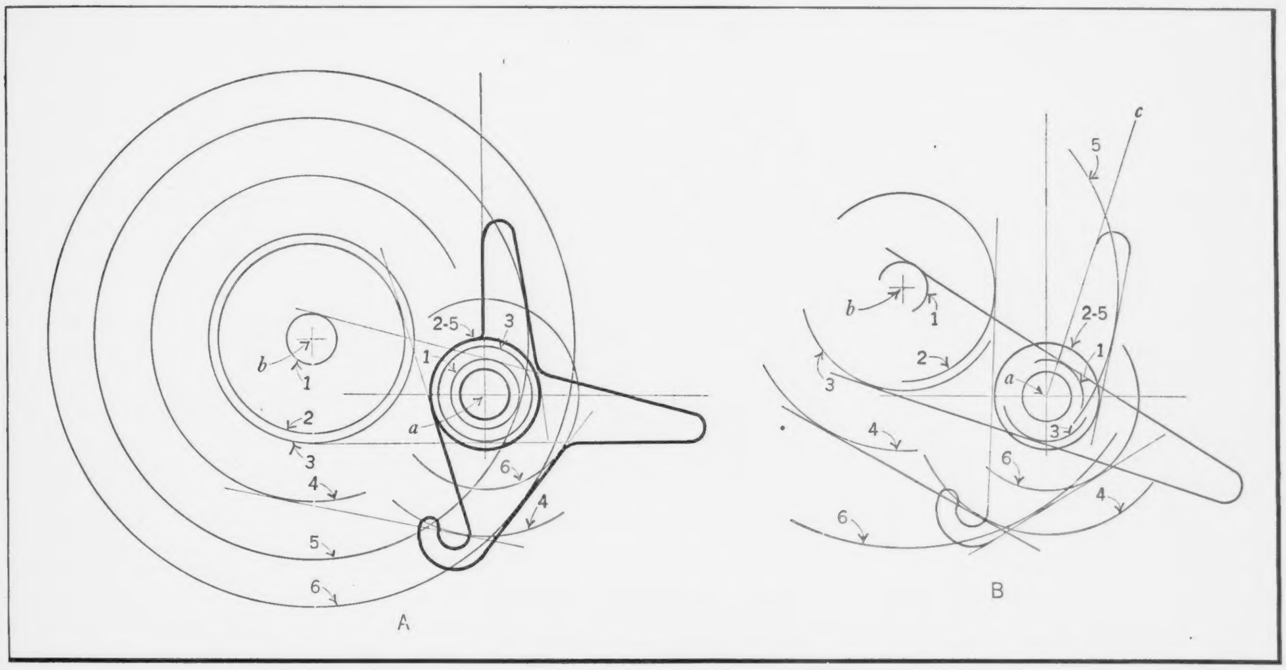
By WALTER H. HAUPT

IN designing machinery, it is often necessary to make more than one lay-out showing a part in different positions in order to determine the relative mechanical action or the clearance at certain points. If the part is intricate in shape, it becomes a tedious task to reconstruct it at a different angle and often involves a great deal of calculating and measuring. With the method described in the following, however, the work is much simpler.

To illustrate this method, we will assume that the lever shown at *A* in the illustration is to be redrawn in another angular position, as indicated at *B*. The center of rotation of the lever is at *a*. At some convenient position, as at *b*, locate a point. With this point as a center, scribe arcs or circles tangent to as many straight parts of the lever as possible, as, for example, arcs Nos. 5 and 6.

Other arcs are then drawn that are tangent to lines projected from the remaining straight parts of the lever. Following this, arcs are drawn that are tangent to a line passing through the centers of the hooked portion of the lever. All the arcs mentioned have a common center at *b*. Now the same procedure is followed with *a* as a center. Arcs are drawn tangent to the straight parts or their projections, and also to the straight line passing through the centers of the hooked end of the lever.

To redraw the lever at *B*, draw line *ac* at the required angle and locate the center *b* in its new position. All the arcs with their corresponding tangent lines are then redrawn as indicated. By numbering the arcs in both views, little confusion will result. Occasionally, in using this method, it will be found that the two points of tangency on a line are too close together to obtain an accurate reconstruction. In this case, it may be necessary to establish an additional center similar to that at *b*. The circle or circles scribed about this center must, of course, be transferred to the new view in the manner already described.



A Lever Drawn in Two Positions by Means of Arcs and Tangents to Reduce the Drafting Time

* * *

The re-equipping of the country with modern machinery will alone go far to make prosperity. Still greater possibilities lie in the undreamed of arts, businesses, and industries that this fairy of technical progress will almost certainly produce from her magic box.... So many prophecies of the past that have sounded a warning of a finished world have proved so foolish, when viewed in the light of subsequent events, that it must take a brave, and, I might add, foolish man to record his opinion to that effect as a result of our present troubles.—*S. M. Kintner, Vice-president, Westinghouse Electric & Mfg. Co.*

A New Device in Machine Design

By S. A. HOLME, Industrial Engineering Department
General Electric Co., Schenectady, N. Y.

Electric-Hydraulic Thrustors are Self-Contained Devices that Impart Uniform Straight-Line Movements up to 16 Inches and Constant Pressures to 6400 Pounds

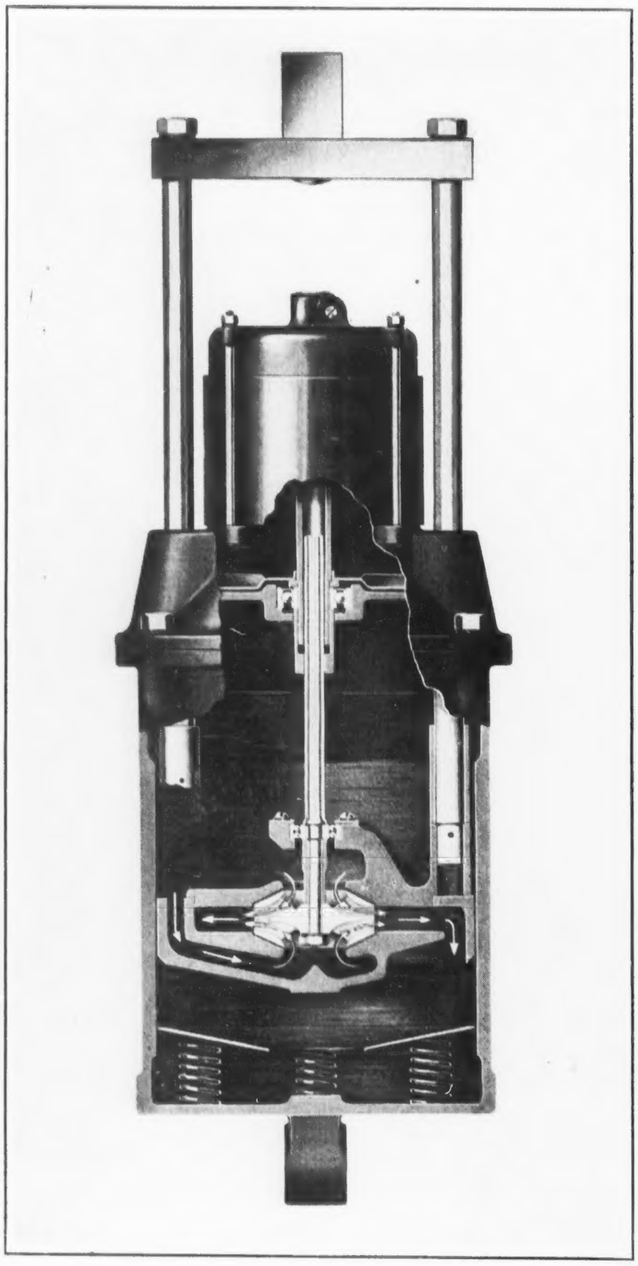


Fig. 1. Thrustor in which a Motor-operated Centrifugal Pump is Incorporated in the Piston to Impart a Straight-line Movement

A NEW device, known as a "thrustor," for imparting a straight-line movement is finding constantly increasing use in many industries, including steel mills, machine shops, mines, and wire manufacturing plants. These thrustors are self-contained devices, made in several sizes varying in stroke from 2 to 16 inches and in thrusting pressure from 50 to 6400 pounds. The power cost of operating these thrustors is very small. For example, the power requirements are as low as 1.25 amperes, at 200 volts, for a thrustor capable of delivering 600 pounds pressure and having a maximum stroke of 6 inches.

Three types of thrustors are available; the general principle of all types is similar and is illustrated in Fig. 1. This thrustor is of the type used for the shorter strokes and lower thrust pressures. It consists essentially of a vertical oil tank or cylinder housing and a combined piston and impeller, the latter being rotated by a motor mounted on the top of the tank. The entire device is controlled by a suitable switch which stops and starts the motor.

Two thrust rods are secured to the piston and pass through bushings in the top of the tank, terminating in a cross-beam to which is fastened a clevis for connecting the unit to the machine member. A clevis is also provided at the bottom of the tank for anchoring the device to the machine. If a rigid mounting is required, however, the tank may be equipped with suitable lugs. No stuffing-boxes or glands are required in this device, thus eliminating one source of trouble frequently experienced with other units using air or steam. In addition to this, a smoother action of the piston and push-rods is obtained.

The action of the device is such that the impeller pumps oil from the top through to the under side of the piston, thereby causing the piston and push-rods to rise. Intake ports admit oil to both the upper and lower sides of the impeller, thus giving quick operation and obviating the effect of impeller end thrust. As the piston reaches its upper limit of travel, it stalls, and under these conditions the input to the motor is considerably reduced. The load, however, is maintained in the top position, owing to the fact that pressure is being created solely for the purpose of keeping the load in one position and not for moving it.

If the motor is stopped at any point, the oil rushes back through the piston and impeller, allowing the piston and push-rods to return quickly to their lower position. On the return of the piston, a conical spring baffle, provided on the larger sized units, closes the oil port and cushions any shock

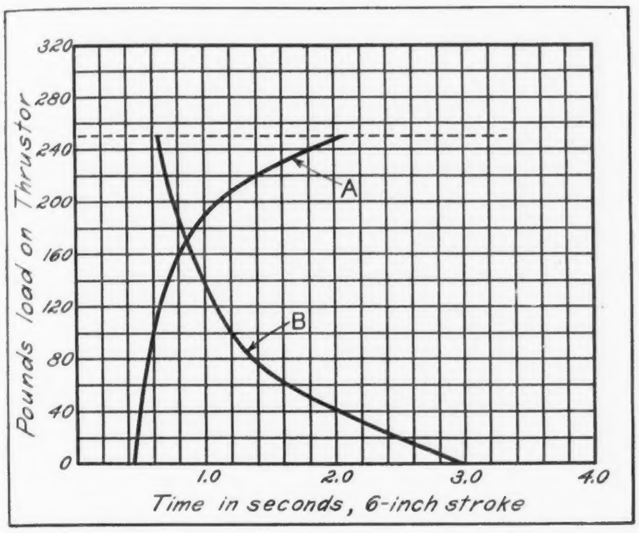


Fig. 2. Chart for Determining the Speed of Operation for Various Thrustor Loads. Curve A, Total Time for Piston to Reach Top of Stroke after Motor is Energized; Curve B, Total Time for Piston to Reach Bottom of Stroke after Motor is De-energized

which might otherwise occur. The upper end of the stroke may also be cushioned in certain cases, if required.

The action of the larger type of thrustors is somewhat different from the smaller type in that the impeller is separate from the piston and remains at the bottom of the tank. An oil passage is provided at the center of the tank through which the oil is transferred to the proper side of the piston during the up and down strokes. The impeller is similar in construction to that in the smaller units, but the fact that it is placed at the bottom of the tank allows a more rigid assembly.

Overload on the thrustor cannot injure the motor. If the load is greater than the unit can lift, the piston will remain at the bottom of the cylinder and the impeller will spin harmlessly in oil. Thrustors can be tipped 10 degrees either way from the vertical when a full stroke is used. A partial stroke can also be obtained, with a maximum tilt of 35 degrees.

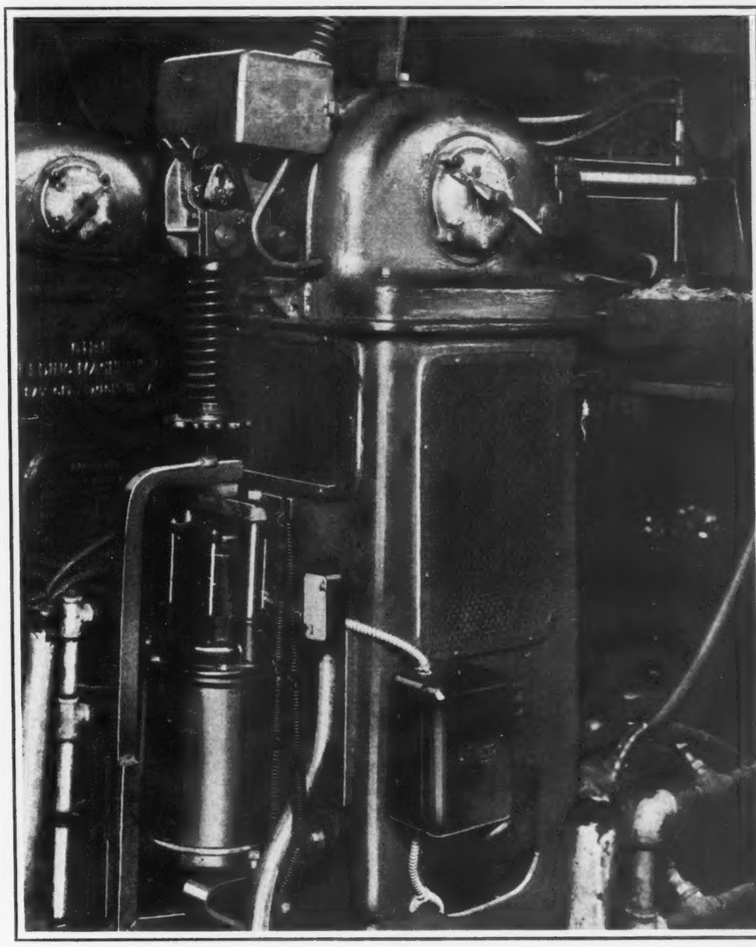
Determining the Speed of Operation

The speed of operation on the up stroke is, of course, dependent upon the difference between the thrust delivered and the thrust required to overcome friction in the impeller, push-rods, and mechanism to which the device is attached. The greater this difference, the greater will be the accelerating force and the faster the operation.

Referring to the curve *A* in Fig. 2, it will be seen that for a 250-pound unit, the time in seconds for a 6-inch stroke varies considerably with the load. With a 240-pound load the unit takes 1.8 seconds to come up to the full limit of travel; but with a 200-pound load, it will travel the same distance in a little over one second. It will be noted that the time-thrust curve does not start from zero, time allowance being made for the motor to bring the impeller up to the speed at which the piston starts moving. In the case mentioned, this amounts to 0.47 second.

Speed of operation on the down stroke depends on the returning force exerted at the top clevis, and the greater this force is, the less will be the time of return. For the same rating, the thrustor returns to the lower limit of travel in 0.65 second with a 250-pound load; but as the load decreases, the time of return is increased, until at a zero load, the device takes practically three seconds to return to the lower position. The time for the motor and impeller to come to rest does not appear on this curve, since the piston will commence to move as soon as the speed has dropped to a point where sufficient pressure no longer exists in the tank to support the load. The less this load is, the slower must

Fig. 3. Application of a Thrustor for Obtaining any Desired Welding Pressure in a Welding Machine



be the speed of the motor and impeller before the piston will start to move downward. In certain cases, the full length of the stroke is not required, and under these conditions speed of operation, both up and down, is increased.

Varying Speed of Operation

If decreased speed of operation is required, the thrustor can be equipped with a control that enables this to be accomplished. In the smaller sizes, the speed of operation on the up stroke can be decreased by inserting resistance in the motor circuit, which reduces the speed of the motor, but this also reduces the thrust obtained from the impeller.

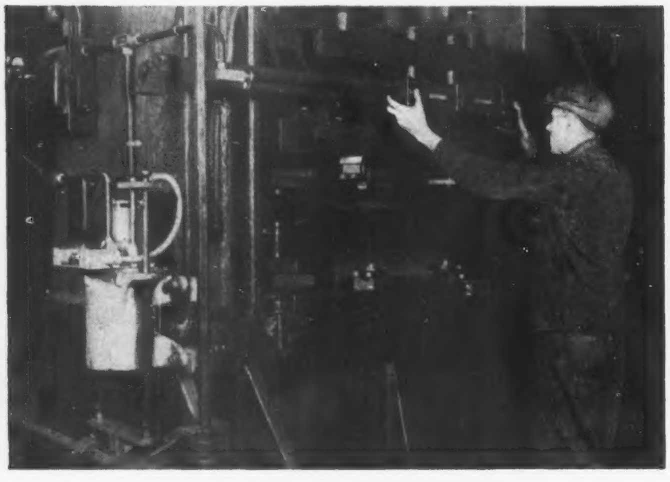
On the down stroke, a delay feature is obtained by means of a specially controlled valve which may be adjusted from the outside. This valve constricts the flow of oil on the return stroke in such a manner as to cause the piston to lag. For the larger thrustors, both of these operations are performed by means of externally controlled valves. The control of the upward stroke, if by electrical means, has been found particularly desirable in cases where a variable thrust is required.

Typical Examples of Thrustor Applications

Many thrustors are used directly as power units for operating brakes, stamping presses, nail pullers, numbering machines, and spot-welding machines. They are also used for operating control devices on punch presses, indexing presses, and conveyors, and for the operation of lifters for planer tools, clamping devices for radial drills, valves, and other mechanisms where solenoids have previously been used or where a smooth action and a positive thrust are essential.

Some of these applications are shown in Figs. 3, 4, and 5. In Fig. 3 the thrustor is combined with a pressure switch on a welding machine to allow any desired welding pressure to be used. The control is arranged so that as soon as the correct pressure (corresponding to the welding pressure) is built up in the tank, the motor is stopped. The push-button switch is located on the floor to allow the operator to have both hands free.

Fig. 4. A Thrustor Operated by Push-buttons on this Heavy Press Makes Possible Effortless Control



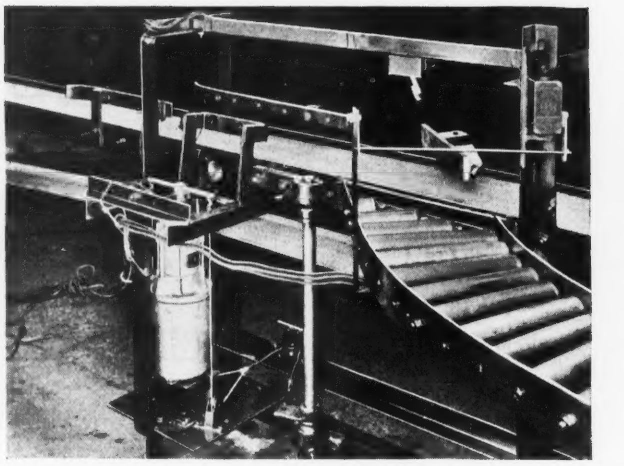


Fig. 5. A Series of Thrustors is Used Here to Operate Thirteen Diverters for Ejecting the Work at Various Points on the Conveyor

In Fig. 4 is shown a thrustor applied to a punch press to produce effortless control and to decrease the operating hazard. The two push-buttons for energizing the thrustor are in series, and both must be pressed before the machine will operate.

A thrustor is shown in Fig. 5 for controlling the flow of work along conveyors. The thrustors, one of which is shown, are used to operate diverters, thirteen in number, for taking off work-pieces at different points as required. Control of these thrustors is centralized in a bank of push-buttons.

Selecting the Thrustor

The determination of the applicability and size of a thrustor depends on such conditions as the number of operations per minute, the amount of continuous running with the piston stalled in its up position, the required speed of each up and down stroke, the temperature of the air in which it must operate, the prevalence of destructive chemical fumes, dust, excessive moisture, etc., and the inch-pounds work per stroke which the thrustor must perform.

Thrustors, being motor-driven, have a time-temperature rating like all other motors, and each size has a maximum number of operations per minute that it will perform without overheating. Its duty must be such that it will not exceed its temperature guarantee. Curves similar to those in Fig. 2 for each size of thrustor show its speed of operation for each up and down stroke, and no application should be made without checking the required speed against the curves. To determine which curve to use, it is necessary to know the inch-pounds of work

that must be performed. This can easily be estimated from a consideration of each individual problem.

For instance, in the case of a device applied to operating a furnace door, the weight of the door will be known and an allowance for friction in the slide can be estimated. The length of travel through which the furnace door has to move will be decided by the design of the furnace. In traveling this distance, therefore, work must be done in lifting the door a certain vertical height to which must be added the work done to overcome friction in the slide. Allowance should also be made for binding of doors that have been warped during the heating process.

From this can be obtained the total number of inch-pounds of work, which will serve as a guide in selecting a suitable thrustor. In a case such as this, speed of operation is not an important factor, because it is unnecessary and undesirable to move a heavy door at a very rapid rate.

An entirely different set of conditions exists in the case of a thrustor applied to some device in which quick action is necessary. A certain amount of work must in all cases be done by the unit in lifting the load to the full limit of travel, but many applications exist in which a quick return stroke is desirable. In this case, it is usual to increase the load by placing an additional weight to act on the top clevis. The thrustor, therefore, does a greater amount of work on the up stroke than is really necessary, but returns rapidly on the down stroke because of the additional load. The additional load for a certain speed of operation can be obtained by reference to the speed-time curves which are given for each thrustor rating.

Simple Method of Brazing High-Speed Steel Tips to Low-Carbon Steel Shanks

By J. M. HIGHDUCHECK, Supervisor of Cutting Tools and Applications
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

The economy of using welded tips on metal-cutting tools is widely recognized, yet a simple method of brazing these tips to their shanks is not generally known. Commercial compounds are available for brazing high-speed steel (including cobalt high-speed steel) to low-carbon shanks. One of these compounds consists of 12 per cent borax, 20 per cent of fifty-per-cent ferro-silicon and 68 per cent of eighty-per-cent ferro-manganese. To this is added 25 per cent by weight of clean high-speed steel filings, and all the ingredients are mixed thoroughly. This compound is suitable for welding high-speed tips to shank material having the following composition range: Carbon, 0.50 to 0.63 per cent; manganese, 0.60 to 0.90 per cent; phosphorus, 0.04 per cent maximum; and silicon, 0.15 per cent minimum.

In preparing the shank for brazing, it is first forged to the desired shape, the seat also being forged according to requirements. On this seat is spread a 1/16-inch layer of the brazing compound. The tip is then placed in position on the seat and more compound is spread on top of the tip.

The tool is now placed in the pre-heating chamber of a furnace and heated to from 1550 to 1600 degrees F. (843 to 870 degrees C.), allowing sufficient time for complete penetration of the heat. The tool is then removed from the furnace and the tip is pressed firmly on its seat to insure a uniformly close contact with the shank.

After this preliminary operation, the tool is placed in the main furnace chamber. Here it is heated rapidly to a temperature of from 2250 to 2350 degrees F. (1232 to 1288 degrees C.), at which time a cleansing action of the flux and an incipient fusion of the tip and shank take place. This point can be determined by the dark vapor that is given off as the reaction takes place.

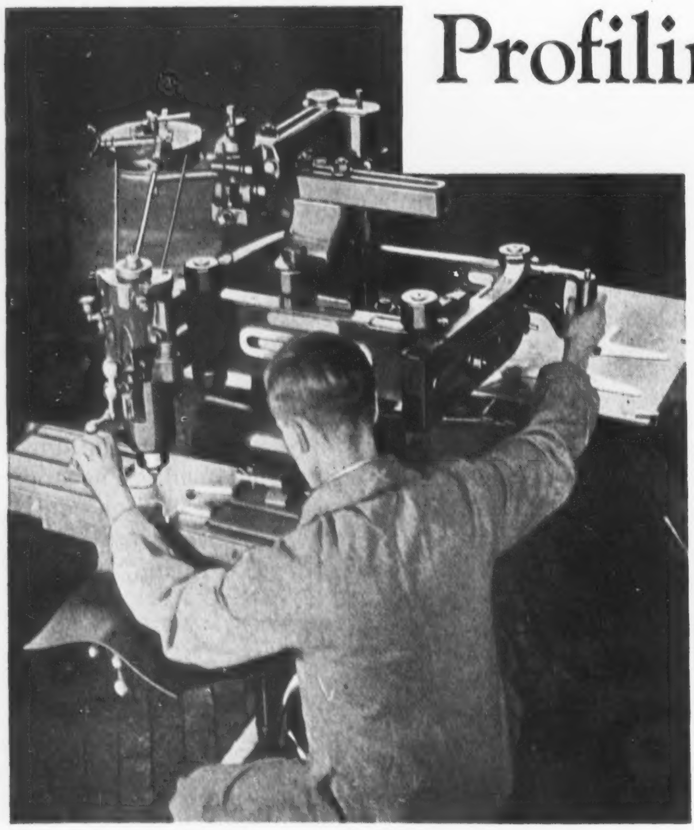
The tool is then removed from the furnace and placed in a press, where sufficient pressure is applied to the tip to force out the slag in the seat. The arbor press used for this purpose should be equipped with a pressure shoe mounted on a pivot, in order to enable the operator to vary the pressure. The shoe should be heated before it is applied to the tip; otherwise cracking of the tip may result.

After the tip is pressed firmly into its seat, the tool is cooled to room temperature by means of an air blast. This is followed by tempering in a salt bath at 1110 to 1150 degrees F. (593 to 621 degrees C.), allowing about one hour per inch of cross-section for this operation. The tool is then air-cooled.

* * *

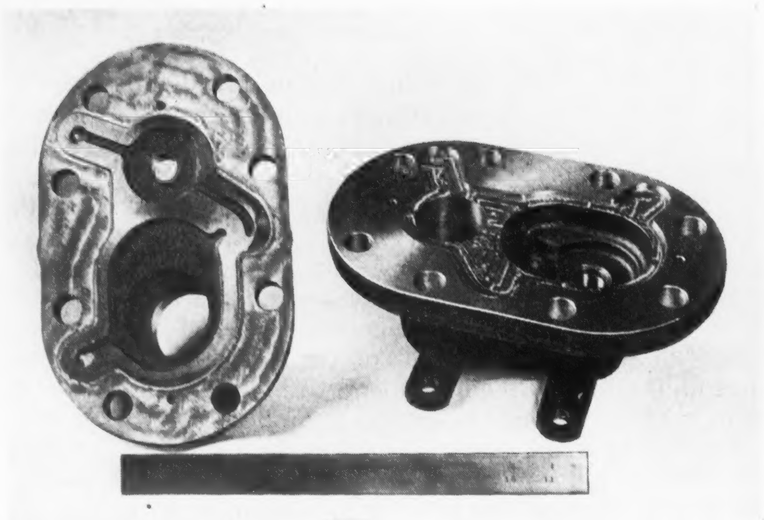
Equipment can be purchased and installed today at costs much below normal. Changes in equipment can best be made now while plants are not busy. Inventors have not been idle. Recent improvement in equipment offers unusual opportunity for cost reduction. Meanwhile it is obvious that the purchase of improved machinery and equipment will bring a positive and immediate stimulus to business recovery, just as the repair and rehabilitation of buildings and equipment will give employment to idle workers and increase their spending.—*General James G. Harbord, Chairman of Board, Radio Corporation of America*

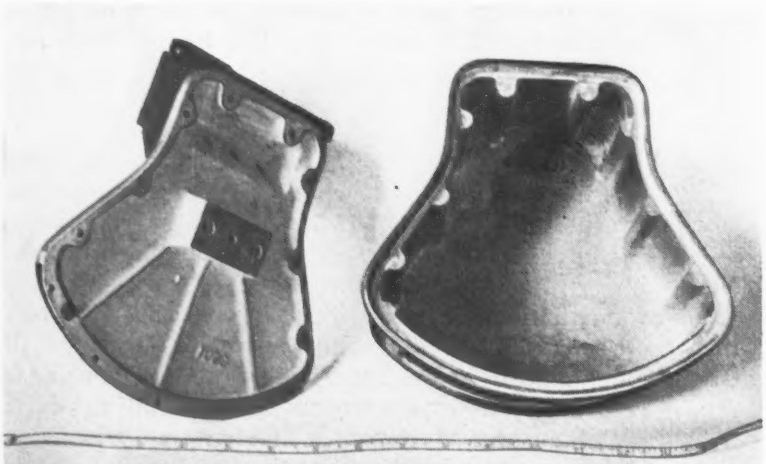
Profiling Operations on



Work-pieces of practically any contour can be finished on pantograph-type die-cutting and profiling machines by merely moving the style of the pantograph mechanism along a flat templet. Identical movements are made by the tool around the work. The illustration at the left shows such an operation on plate material—it indicates the ease with which such parts as cams for automatic screw machines and gusset plates used in structural construction can be produced. All the operations shown here were performed on machines built by the George Gorton Machine Co., Racine, Wis.

The base and cover of an instrument used for measuring the pressure exerted by gases or vapors. Stock has been machined from the face of the cover (at the left) to form a shoulder of irregular outline. This shoulder fits a depression of corresponding outline cut in the face of the instrument base. The shoulder and depression are roughed out on a milling machine and then finished on a pantograph type of profiling machine. Both parts must be machined to size within plus or minus 0.005 inch. The templets are of zinc plate and are of the same outline as the shoulder and the corresponding depression



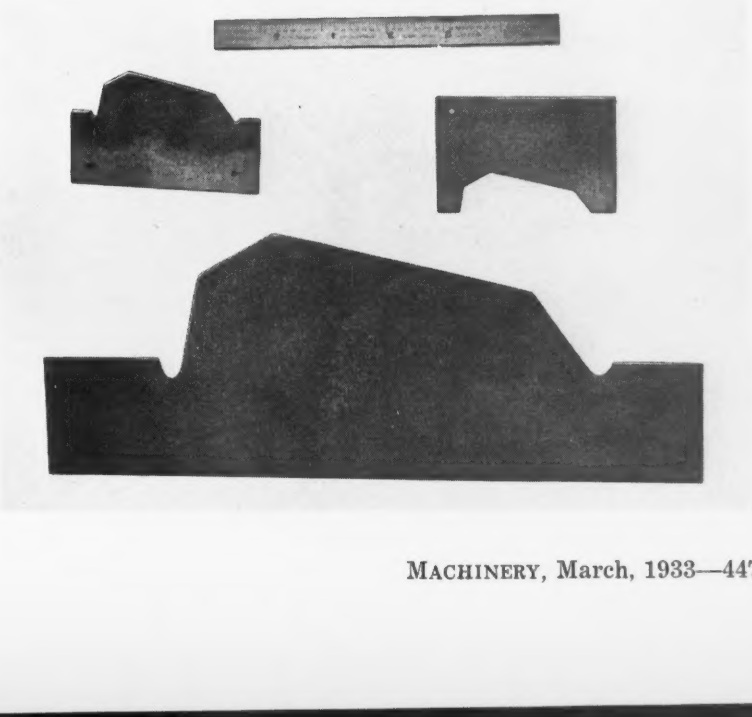


Another example of an instrument base in which a depression is cut to receive a cover that is profiled to fit. By performing both operations on a pantograph type of profiling machine, these parts can be produced to a degree of accuracy that insures air-tightness. Single-lip cutters are used at a speed of 7500 revolutions per minute. The parts are aluminum castings. Two cuts are taken on each part. The base is profiled in one minute, and the cover in from forty to fifty seconds

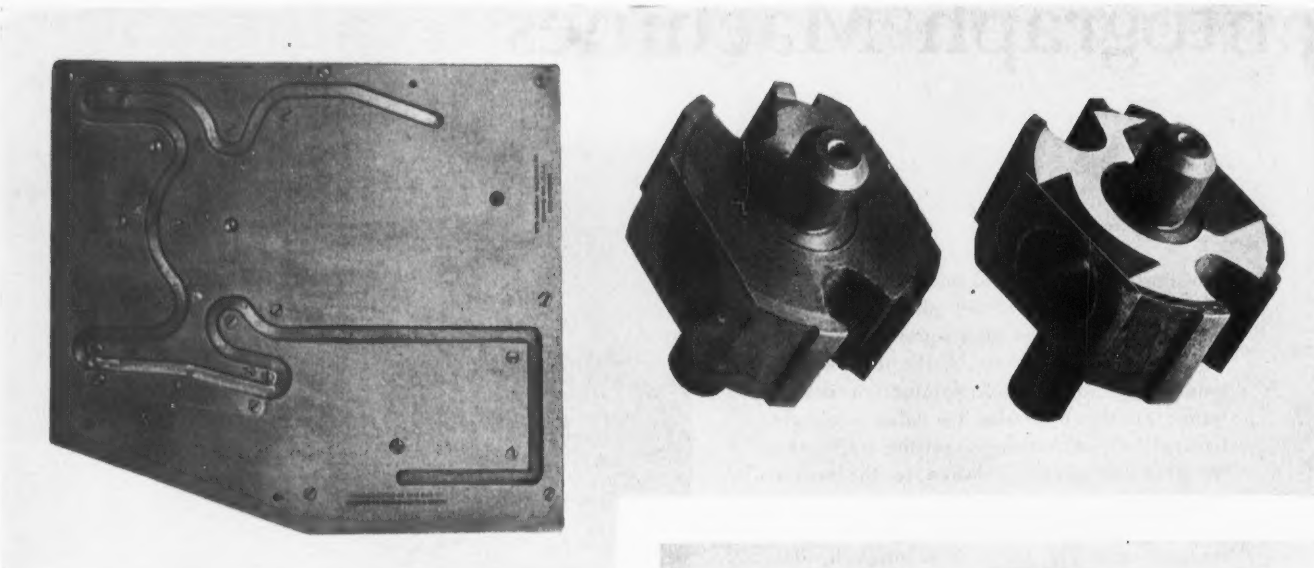
Pantograph Machines

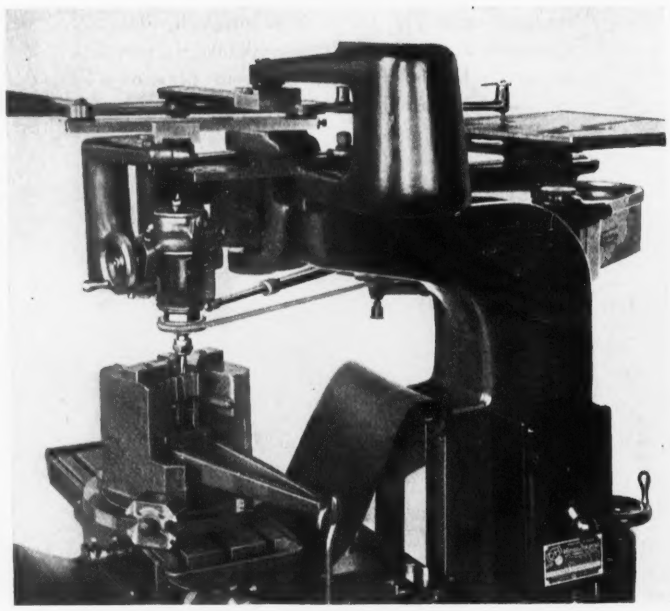
Profiling felt grooves in aluminum magneto covers at the rate of 80 pieces an hour. Each groove is 5/64 inch square and is cut in the form of the letter U, the total length being 4 inches. High production is obtained on this operation by using a simple fixture that insures rapid setting up of the work in the proper relation to the cutter and to the templet that is used for guiding the cutter. Two parts are profiled with each set-up. The cutter is of single-lip design and revolves at 9000 revolutions per minute. Dimensions are held to plus or minus 0.001 inch

Four parts of an electric starter for airplanes, which are profiled along the edges of the joint faces. Two of the templets used for guiding the tools are shown in the background. Altogether six edges of these parts are profiled. The average time per edge is 1 1/2 minutes, or 9 minutes for all the edges. The parts are aluminum-alloy castings. A single-lip cutter is used at a speed of 7250 revolutions per minute. The depth of cut is about 1/32 inch, the widths of the surfaces profiled being 3/16 and 5/16 inch. Accuracy is not of prime importance, but all parts must be interchangeable



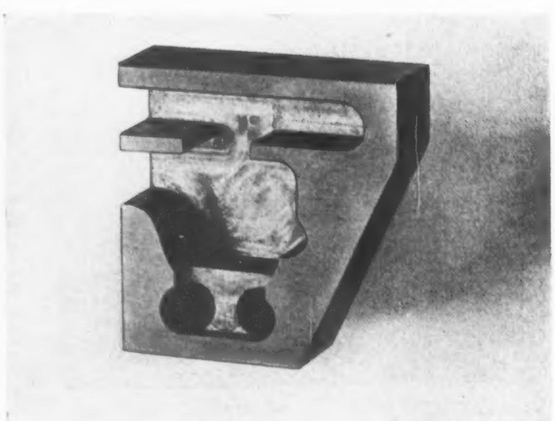
Bottle-mold templets, gages for airplane propeller blades, inserts for die-casting dies, and many similar parts can be readily produced with accuracy on pantograph-type machines. In the upper part of the illustration shown to the right are two bottle-mold templets, and at the bottom is the master copy used to guide the profiling tool in cutting the upper left templet. Five templets, pinned together, are usually profiled at one time. They are made of cold-drawn steel, 0.050 inch thick





The operation shown in the illustration at the right consists of cutting a relief of irregular outline on cylinder castings of electric refrigerators. This relief is clearly seen on the finished cylinder at the extreme right in the illustration above. In the middle of the same illustration is shown a cylinder that has been machined to the point where it is ready for milling the relief, and at the extreme left is the templet used for the operation. The relative size of the templet and the parts in this illustration is not correct, the templet actually having been made three times the size of the work

A brass stamping, 1/32 inch thick, the flange of which is milled on both sides within a plus or minus tolerance of 0.005 inch. The stamping is about 3 1/2 inches in diameter, and the flange 1/4 inch high. In this operation, the pantograph reduction is 3 to 1. Only one cut is taken on each side of the flange. A 1/4-inch diameter, single-lip cutter is used. It operates at a speed of 8000 revolutions per minute

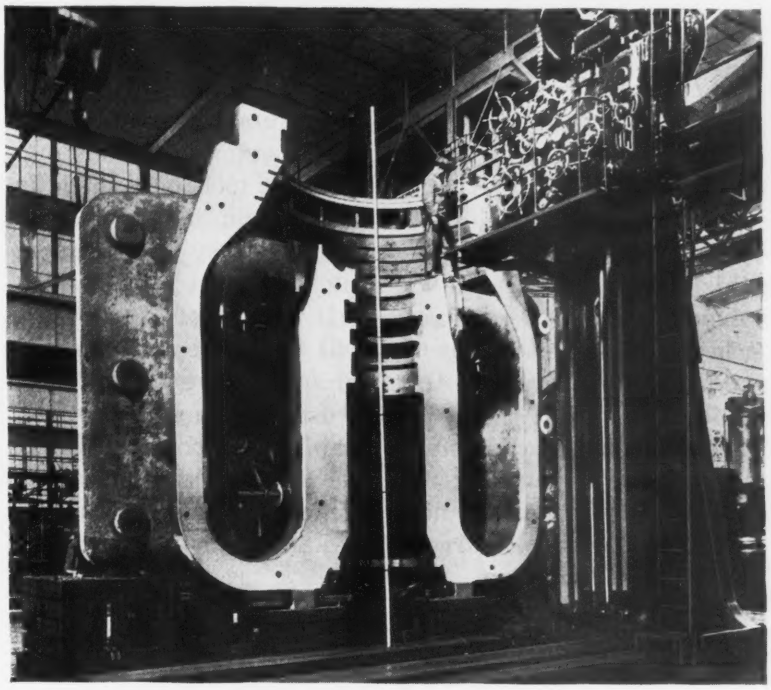


Most of the excess stock is first removed from this gun part by drilling, using ordinary twist drills and square-nose drills. Then the various surfaces are finished accurately to the desired outline on a pantograph-type profiling machine. The time for the profiling operation is only four minutes. Tolerances of plus or minus 0.001 inch are specified for the various dimensions

Notes and Comment on Engineering Topics

The coal production of pre-war Russia was 30,000,000 tons. In 1931, 56,000,000 tons were mined in the Soviet Union. Only the United States, England, and Germany mined more coal than the Soviet Union.

Travelers in the Rhine Valley and other industrial regions of Europe probably have noted that many steel structures—bridges, towers, and metal-clad factories—are painted an attractive harmonious gray color. This attractive appearance results from the use of a distinctive type of paint known as metallic zinc paint. The principal pigment in this paint, which is now being used to an increasing extent in the United States, is metallic zinc powder of such fineness that it is frequently referred to as "zinc dust." The powder is mixed with zinc oxide in a linseed-oil vehicle of the usual type. This paint has been found to be a particularly effective protection against the corrosion of metal surfaces. In addition to its use for steel structures, it has also been found of value in painting galvanized iron, due to the fact that it has unusual adherence.



A Heavy Horizontal Schiess-Defries Boring and Milling Machine in Operation in a German Plant Machining a Big Turbine Casing. The Diameter of the Spindle is Nearly 9 Inches, Maximum Height of Spindle over Table, 20 Feet; Length of Bed, 44 Feet; and Weight of Machine 185 Tons

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In discussing the lubrication of anti-friction bearings, K. A. Newman of the research staff of E. F. Houghton & Co., Philadelphia, Pa., states that recently developed ball-bearing greases contain only from 2 to 5 per cent of filler, or about one-tenth the amount used in ordinary greases. These greases are not merely mechanical mixtures. Their ingredients are combined in colloidal form, producing an absolutely stable mixture which cannot separate in storage or in service.

Nickel-clad steel plate is steel plate protected on one side with a dense homogeneous sheet of pure nickel. The nickel covering has the same chemical and physical properties as hot-rolled or hot-forged nickel in other forms. It is permanently bonded to the steel base-plate and will not separate from it under normal conditions of temperature change, pressure, vacuum, or deformation in forming. Such plates are used in the construction of evaporators, storage tanks, railroad tank cars, and many other types of equipment where a non-corroding nickel surface is desired. A bulletin describing the methods of fabrication of nickel-clad steel plate has been published by the International Nickel Co., Inc., 67 Wall St., New York City. This bulletin covers all the ordinary processes of fabricating this material, such as cold-working, annealing, cold-pressing, riveting, and welding.

According to the Bureau of the Census, welding machines and apparatus were manufactured to a total value of $10,560,000 in 1931. Gas-welding equipment represented a value of $3,892,000, and electric-welding equipment, $6,668,000.

EDITORIAL COMMENT

Research, the Basis of All Engineering Advance

The past half-century has seen a marked change in the attitude of the human mind toward traditional methods. Scientific research has made possible the great engineering advance that we have seen during this period. The successful research engineer constantly questions everything, takes no accepted formulas or "established facts" for granted, and does not permit himself to be baffled by "authorities." His mind projects itself into unknown fields with the idea of ascertaining, through investigation, experiments, and the sifting of recorded data, the true facts.

American industry has advanced largely in proportion to its willingness and courage to engage in fundamental research. Much has been done, but much more remains to be done. On the art of cutting metals, for example, little of a truly fundamental character has been done since the classical experiments of Taylor, conducted some thirty years ago. The reason for this is obvious; the Taylor experiments were very expensive, and no one manufacturer has felt that he could afford to expend such a vast amount on further research in this direction.

Much has, of course, been done by the companies who have given to industry the new types of cutting tools; but there is still room for more fundamental research. Up to the present time it has been largely a case of experimenting with each problem as it arises in practice; fundamental research contemplates the solving of many problems before they are actually met with in practice. Through such research, new pathways are opened up before industry itself recognizes its new needs.

It has been said that the attitude of an industrial concern toward research is more important to its permanent success than the size of its cash surplus. The manner in which small companies frequently forge ahead, leaving many of their older and larger competitors behind, tends to give weight to this statement.

Impractical Methods of Testing Cutting Tools

Frequently we hear it said, with reference to recently introduced cutting tools, such as those of the carbide or chromium-plated type, "We tried these tools, but we did not get successful results." The failure to get successful results is due in many cases to the manner in which the tools were tested.

Progress in the introduction of new types of cutting tools has often been delayed because of wrong methods of testing. It seems to be a generally accepted idea in most machine shops that the way to test a tool is to apply such feeds and speeds as will cause breakage of the tool. Such tests give little or no information of real value. The only tests of practical use are those made under conditions similar to those under which the tools will be used. Tests that merely determine the amount of abuse that a tool will stand before breaking are rather useless. The real object of the test is to find out what a tool will do under working conditions.

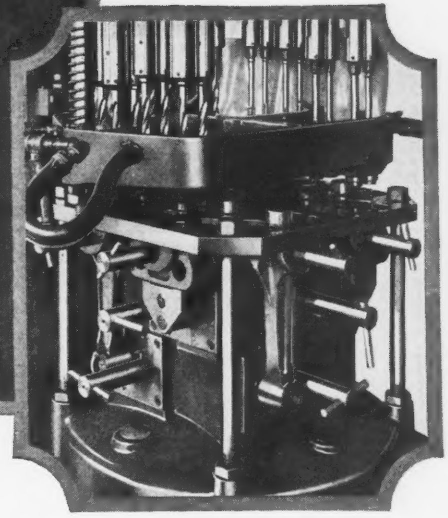
Many of the failures reported with the new carbide cutting tools and with such new products as chromium-plated tools have been due to such erroneous methods of testing. Had the experiments with the tools been made in a sensible manner, results might have been obtained that would have pointed a way to permanent advantages in machining practice.

It may be of interest to find out whether a tool will stand a cutting speed of 500 or 600 feet per minute for five minutes, because this would indicate unusual cutting properties. Yet the information is mainly of laboratory interest and of little use in the shop. What the shop man wants to know is if the tool will run successfully for hours at a time at, say, 200 or 250 feet per minute. Such a test establishes a practical working basis.

The Sketch Language is Good, but it Can Be Overdone

It is well worth while to practice the art of expressing ideas clearly both in speech and in writing. Most men engaged in mechanical work like to speak with sketches—when they want to convey even the simplest idea, they reach for a pencil and a piece of paper. The graphical method is good, but its use can be overdone. It is of great value to be able to make a clear sketch when a sketch is needed, but the sketch language should be avoided when well chosen words will express an idea just as effectively. The ability to explain an idea is often as important as the idea itself. Many a suggested improvement in engineering practice has been rejected, not because of any defect in the idea itself, but because it was so poorly explained that its significance could not be grasped by those with authority to adopt it.

Design of Tools and Fixtures

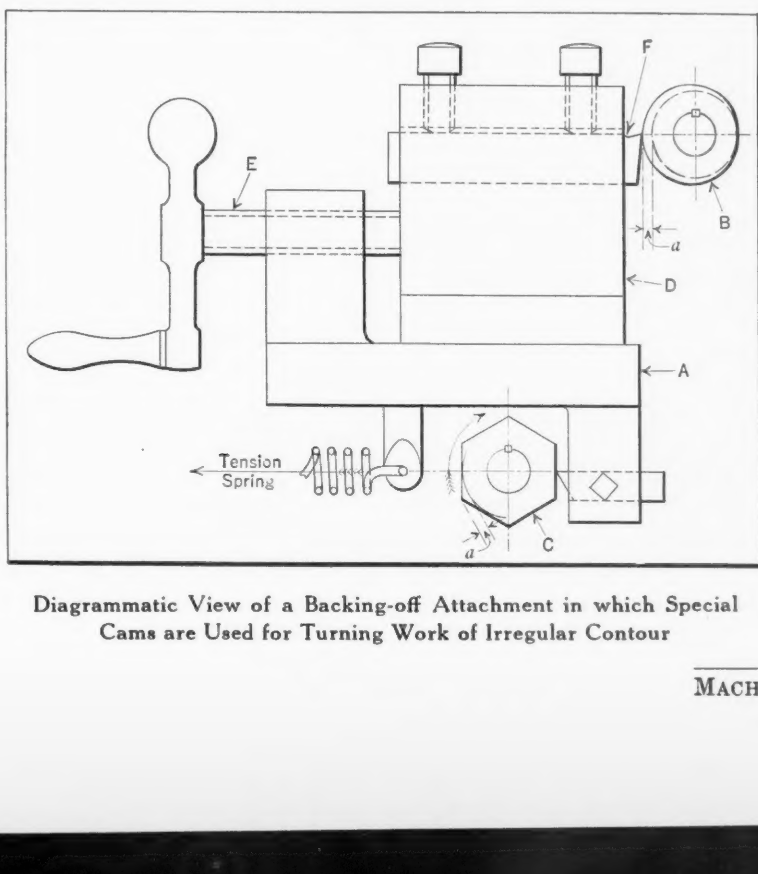


Equipping Lathes for Turning Cams and Other Irregular Shapes

By C. W. HINMAN, Villa Park, Ill.

There is no reason why work of other than circular shape cannot be turned on a lathe, provided it is equipped with a backing-off attachment. It is generally known that a lathe thus equipped can turn a true cylindrical surface eccentric with the lathe centers. The method here illustrated for turning other odd shapes is based on this principle. In the illustration is shown diagrammatically the cam-actuating principle involved in controlling the cutting tool in a backing-off lathe. This principle is also applied in special lathes for turning camshafts in an internal combustion engine.

Slide *A* has a reciprocating movement to and from the work *B*, and is controlled by cam *C*. Toolholder *D* is a sliding fit on slide *A*, and is arranged so that screw *E* can feed the cutter *F* into the work. Change-gears (not shown) control the ratio of revolutions between the cam and the spindle. In this case, the work makes six revolutions to one of the cam. By using this cam, the work will be turned to the cam shape indicated at *B*. If piece *B* is substituted for cam *C*, it will cause cutter *F* to produce work of hexagonal section between the lathe centers. However, it will be necessary to reverse the ratio so that the camshaft will turn six times to one revolution of the spindle.



Diagrammatic View of a Backing-off Attachment in which Special Cams are Used for Turning Work of Irregular Contour

This method has been used successfully in one case where a hexagonal tool-steel piece 4 inches in length and 2 1/2 inches across the corners was required. The specifications called for a series of intricate parallel depressions on each flat at right angles with the axis of the piece, the six flats being exact duplications of one another. This piece was subsequently used as a multiple forming punch, only one flat being used at a time. Thus, when one side became worn, the punch was merely revolved 60 degrees to present a new forming surface to the work. To turn the punch, a forming cutter was used in place of cutter *F*, the edge of the cutter corresponding with the depressions.

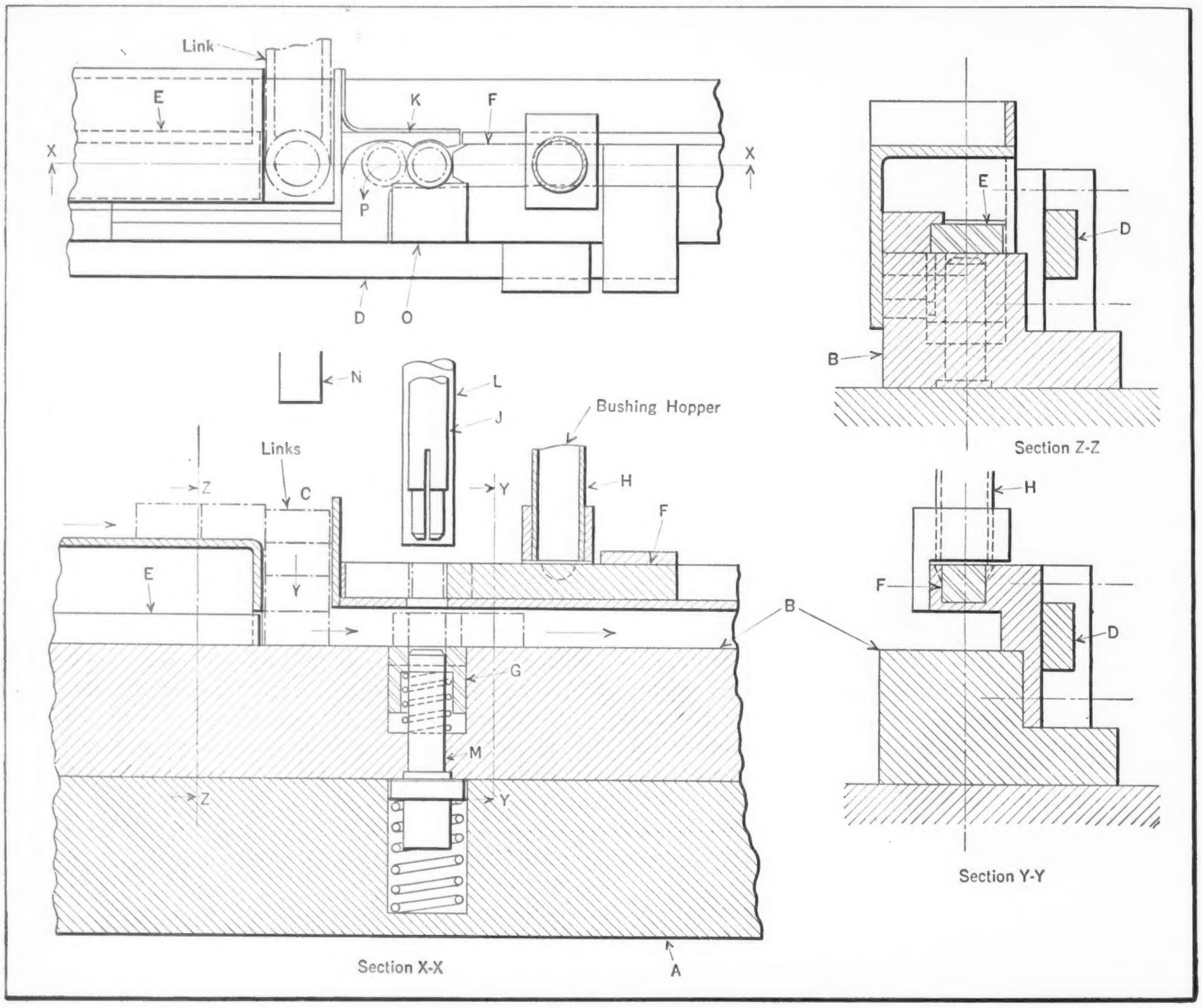
Oval and elliptical sections are easier to produce in this way than hexagonal or octagonal sections. The reason for this is that in the former sections there are no abrupt corners which might cause the cutting tool to "dig in," and the tension spring must be strong enough to prevent this condition. Also, shapes having abrupt inside-curved surfaces should be avoided, unless these surfaces are finished in a later operation.

Fixture for Assembling Bushings in Ends of Links

By ANDREW BEUSCH, Wesleyville, Pa.

To assemble bushings in a hub or link by hand with the aid of an arbor press is rather slow and tiresome work. In order to handle a job of this kind on a more efficient production basis, the writer designed the assembling fixture shown in the illustration. This fixture is arranged for assembling bronze or steel bushings in links of aluminum alloy, and will accommodate links of different lengths. Two assembly units, one for each end of a link, are screwed and doweled to base *A* and can be located to suit the length of the links. The illustration shows only one of the units. A hopper for the bushings is connected with each assembly unit. Base *A* also carries the frame for the crankshaft and ram that operate the fixture.

The unit consists of the rail *B*, which serves as a base for the moving parts. The hopper is also attached to this rail. The operator feeds the links from the left in the direction shown by the arrow, so that they are stacked at *C*. A reciprocating slide-bar *D* operates a feed shuttle *E* for the links and a shuttle *F* for the bushings. On the forward stroke, the shuttle *E* puts a link on pad *G*, then returns, and shuttle *F* takes a bushing from tube *H* and puts it between clamp *K* and the side of the shuttle box above the hole in the link. The punch *J* descends and carries the bushing down while spring plunger *L* depresses the link until pad *G* strikes bottom, so that pin *M* enters the hole in the link, locating it so that the bushing will enter the hole properly.



One Side or Unit of a Hopper-fed Fixture for Simultaneously Assembling Bushings in Both Ends of a Link

Pin *M* is depressed as the bushing is pressed into place. The assembled link and bushing is raised as soon as the punch returns to its upper position, and the operation is repeated. The assembled links slide out at the right as new pieces are moved in from the left. Spring plunger *N*, which moves with the punch, keeps the links moving in the stacker *C*. Should a bushing fail to enter the hole in the link, a safety device prevents the fixture from being damaged. In this case, the bushing is raised and is stripped off by plate *O*; it is then ejected, as indicated at *P*, by the next bushing that is brought into place by the shuttle.

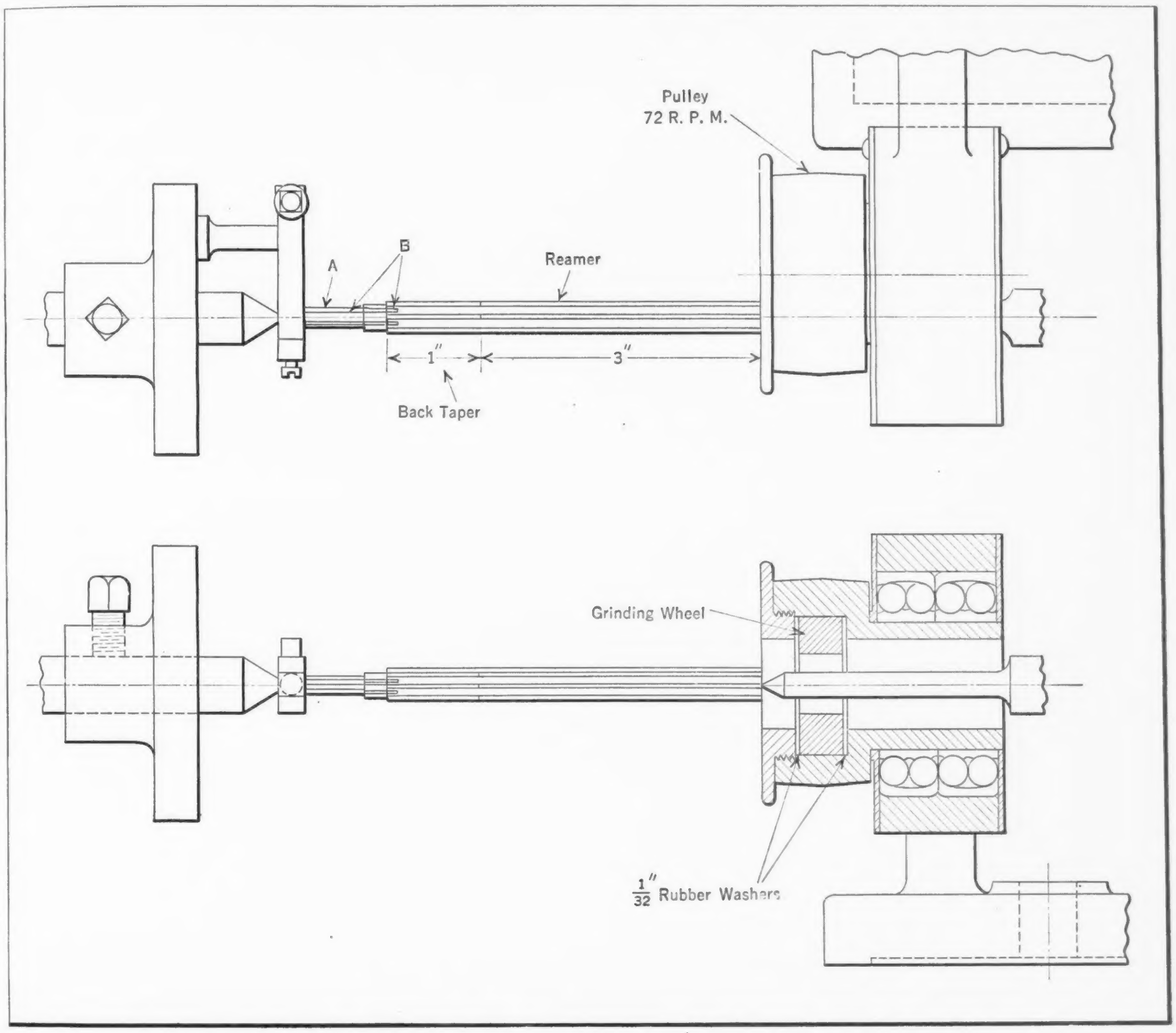
Attachment for Relieving Rifle Barrel Reamers

By JACK FINLAY, Assistant Manager, Tool-room Section
Small Arms Factory, Lithgow, New South Wales, Australia

The attachment shown in the accompanying illustration is used on a No. 1 Brown & Sharpe universal grinder for grinding eccentric relief, both on the tapered and the straight portions of rifle barrel reamers. This attachment is so designed that the grinding is done with the internal surface or hole in the grinding wheel instead of with the outside of the wheel. The reamers are made from a carbon tungsten steel. Previous to the relieving operation, the equally spaced flutes are ground on a Harris hob grinder.

The pulley on the headstock spindle has five equally spaced holes in it for an indexing pin that passes through a hole in the rear of the headstock casting. This indexing arrangement enables the reamer to be properly positioned for relieving the five cutting edges. The parallel portion of the reamer is first ground with eccentric relief. The table is then swiveled to the correct angle for grinding the eccentric relief on the back-tapered portion.

The shanks A of the completed reamers are soldered into steel tubes, precautions being taken to keep the saw cuts B in the shank clear of solder. The reaming operation is performed by drawing the rotating reamer through the hole in the rifle barrel. Oil forced through the tubing and saw slots serves as a cutting lubricant and washes the chips ahead of the cut.



Attachment Used on Brown & Sharpe Grinder for Relieving Rifle Barrel Reamers

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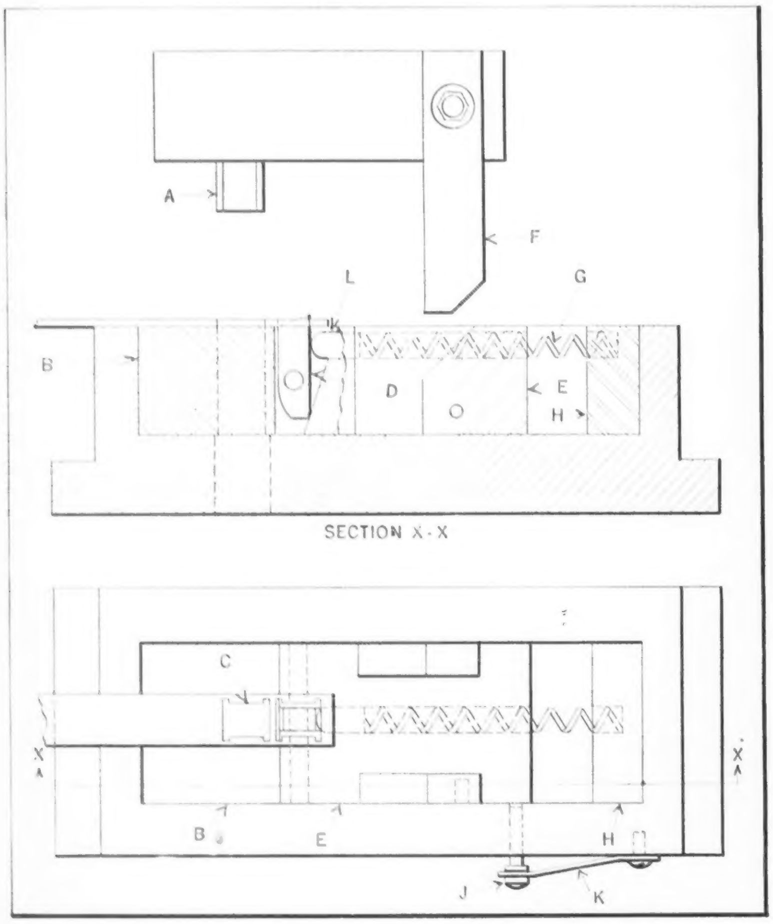
A Self-Feeding Blanking Die

The illustration (see the next page) shows a blanking die that automatically feeds the stock. The stock, guided by a stripper plate (not shown), is fed from left to right as indicated. The punch A, entering the die B, pierces the stock at C. Pawl D is pivoted in the sliding block E, which is given a

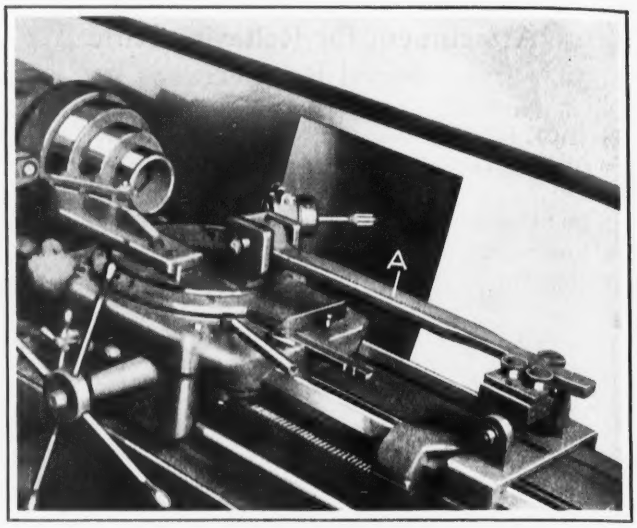
reciprocating movement by two cams F as the ram of the press descends. Spring G, seated in stationary block H, enters block E and, with plunger L, serves to back up the pawl D. Spring G also returns block E to the position shown, after it has been moved to the right by the cams F.

It will be noted that pawl D in the illustration has engaged the first pierced hole in the stock. As the ram descends, the cams F come into contact with the angular surfaces of block E and move it toward the right. Pawl D moves with block E; consequently, as the pawl is engaged with the hole, the strip will be carried toward the right with block E. This movement takes place before the punch has reached the stock and ceases when cams F have left the angular surfaces of block E. Thus, there is no movement of the stock while it is being pierced. As the ram ascends, the spring G returns block E to the position shown, and pawl D enters the next hole, ready for the succeeding feeding movement.

In starting the stock into the die, it is necessary to punch the first two holes before the pawl is permitted to engage the stock. This is done by locking block E so that it cannot move, by means of the finger-pin J. This pin normally is held out of engagement with the block by the spring K. After the second hole is pierced, pin J is released, permitting block E to return to the left-hand position, so the pawl engages the first pierced hole. Automatic operation proceeds from this point. R. H. K.



Blanking Die with Cam-actuated Pawl-slide for Feeding the Strip



Turret Lathe Set-up in which a Combined Swiveling and Longitudinal Turret Movement Guides the Cutting Tools for Crowning Cone Pulleys

Simple Turret Lathe Set-Up for Crowning Three Steps of a Cone Pulley Simultaneously

By AVERY E. GRANVILLE, Knox, Ind.

Turret lathe attachments for crowning pulleys are usually expensive. As a rule, the attachment consists of a cam-actuated slide. In the design shown in the illustration, however, a slide is not necessary, because the turret itself takes the place of the slide.

In this case, a three-step cone pulley is being crowned. Three cutters are mounted on a tool-holder secured to the flat turret, so that all three steps will be crowned simultaneously. A combined swiveling and longitudinal movement of the turret causes the tool to follow a curved path as required for crowning the pulley. The swiveling movement is obtained through a cam indicated at A, which is hinged to a block secured to the turret. The other end is confined between three rolls. The pivot of the rear roll is secured to a bracket attached to the lathe bed, while the two front rolls are mounted on a spring-actuated slide. The rolls on this slide exert a constant pressure against the cam, which keeps it in contact with the rear roll.

The contour of the cam surface engaged by the rear roll is such that when the carriage is fed forward, the turret is swiveled so that the cutting tools are caused to travel in the required path. When not in use, the cam can either be removed from the turret by withdrawing the hinge pin or swung up out of the way. Pulleys having any number of steps can be crowned with this arrangement by merely modifying the tool-holder.

Ideas for the Shop and Drafting-Room

Time- and Labor-Saving Devices and Methods that Have been Found Useful by Men Engaged in Machine Design and Shop Work

Using a Portable Blower to Remove Chips from Cutter

A hand or portable blower of the type used in shops for cleaning motors has proved very effective in keeping chips from clogging up the cutter when performing end-milling operations. In milling slots 1/2 inch wide by 26 inches long in cold-rolled steel, the chips interfered with the cutting action of the end-mill to such an extent that the finish was very poor. By using the hand blower to blow the chips out of the way, an excellent finish was obtained, with a considerable saving in time.

Rochester, N. Y. H. W. MASS

List of Parts Used in Place of Assembly Drawings

Assembly lists, arranged as shown in the accompanying illustration, are of great assistance in obtaining construction data on machine parts from the detail drawings, especially when no assembly drawings are available. Generally, it is much simpler to make up such a list than to prepare an assembly drawing. Any part of the list can be made up separately and additions made whenever it is convenient to do so. It will be noted that some of the more complex details, such as Part No. 1, require an extra space.

The heading for the fourth column, "Assembled with," refers not only to parts that are adjacent to the given part, but also to parts that are closely related to it. For example, if the part is a pulley, the number of the pulley it drives or is driven by should be included in Column 4. In the case of shafts supported by a frame, the numbers of the bearing, the shaft, and the frame should all appear on the list as belonging to the shaft assembly.

Winamac, Ind. WILLIAM H. KELLOGG

ASSEMBLY LIST

SHEET NO. 1

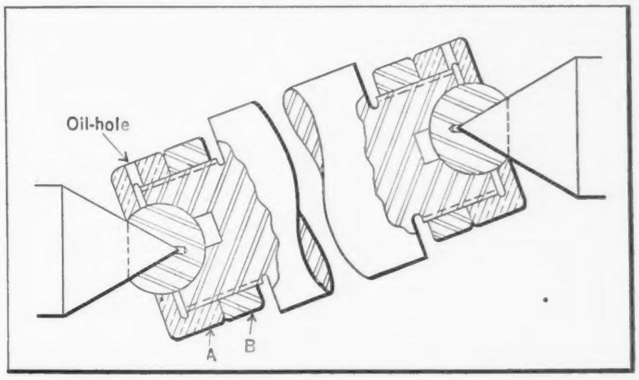
AUTOMATIC WIRE TYING MACHINE NO. 1

PART NUMBER	DRAWING NUMBER	NAME OF PART	ASSEMBLED WITH
1	1	LEFT	2-4-10-14-125-200-201-230
	1	SIDE FRAME	240-245-246
2	20	CROSSHEAD	1-3-13-14-22-125
3	25	CONNECTING ROD	2-4-25-60-65
4	26	CRANKSHAFT	1-3-6-16-30-35-50

Assembly List of Machine Parts that Facilitates Location of Detail Drawings Required in Machining or Assembling Parts

Arbor for Taper Turning with Tailstock Offset

Taper attachments are not always available, especially in the smaller repair shops, and in such cases, the method of setting over the tailstock is usually resorted to. In turning a taper in this manner, the centers are not properly seated in the center holes; consequently, the center holes, as well as the centers themselves, are soon scored. This condition generally results in an inaccurate job. In one repair shop this trouble was overcome by constructing an arbor, in each end of which is mounted a ball containing a center hole of ample proportions.



The Ball-end Construction of this Arbor Prevents Scored Center Holes and Increases Accuracy when Turning Tapers with the Tailstock Offset

As indicated in the illustration, both ends of the arbor are bored to fit the balls, which are held in position by the retaining nut *A* and the check-nut *B*. The nuts are adjusted so that the balls fit snugly in their sockets. With this arrangement, the lathe centers are seated properly in their center holes during the turning operation. In making the arbor, the ends were bored out and then lapped by means of balls of the same diameter as the balls to be held in the arbor. Provision was made for lubricating the balls by drilling a hole through each of the retaining nuts.

Belleville, N. J. J. E. FENNO

Four-Position Trunnion Type Fixture

By CHARLES C. TOMNEY, Tool Engineer
Brunswick-Kroeschell Co., New Brunswick, N. J.

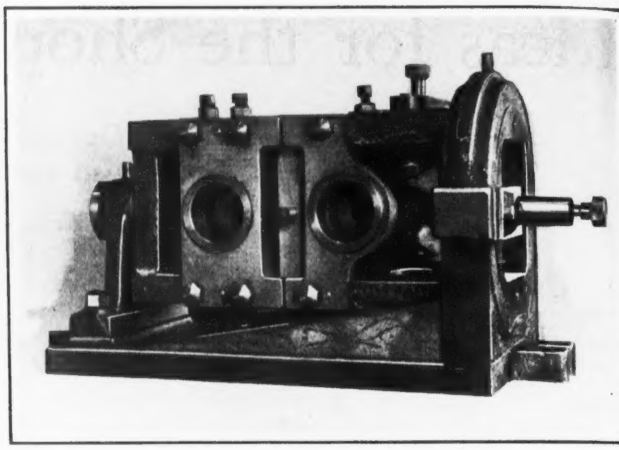


Fig. 1. Trunnion Type Fixture that can be Indexed to Permit Machining Four Sides of Work

FIXTURES of the type shown in Fig. 1 make it possible to perform machining operations on three or four sides of a piece such as the suction header shown in Fig. 2 without unclamping the work. This type of fixture can be used to replace several jigs or fixtures of the kind ordinarily used for such work. Parts of varying sizes or of entirely different designs can, in many instances, be machined on such fixtures by providing interchangeable locating blocks, clamps, bushings, or bushing plates.

All parts of the jig are made of cast iron, with the exception of the bushings, clamps, and indexing pin. The work-holder *H*, Fig. 3, has a bearing *I* at one end which is 2 inches in diameter. The bearing *K* at the opposite end is 9 inches in diameter and 2 inches wide. This large bearing permits the work to be inserted at that end of the holder. The work is located lengthwise by placing the flange ends *N*, Fig. 2, in the V-block *M*, Fig. 3. Two cap-screws *O* are used to clamp the work against two properly adjusted and located cap-screws *P*. Set-screws *Q* are provided to accommodate another part of larger size. A clamp *V* holds the work down on the lugs *N*. To remove clamp *V*, it is only necessary to move it sidewise until one end clears the overhanging lugs *S* on one side of the bushing plates.

The work-holder *H* can be indexed to any one of four positions by means of the indexing pin *U* and four equally spaced bushings pressed into the end of the work-holder. For the part shown in Fig. 2 only three of the indexing positions are required. The surfaces *A*, *B*, *E*, and *F* are machined with the tools *W*, *X*, and *Y*, Fig. 3. The holder for tools *W* and *X* is guided by the bushings *Z*. Each surface is first faced by the flat double-edged tool *W*, the depth of cut being determined by the adjustment of stop-collars on the tool-holder.

In machining surfaces *E* and *F*, Fig. 2, a slip bushing is inserted in the opening *C*, Fig. 3, to guide the holder for cutters *W* and *Y*. Slip bushings that fit the tool-holder bushings in opening *C* are used

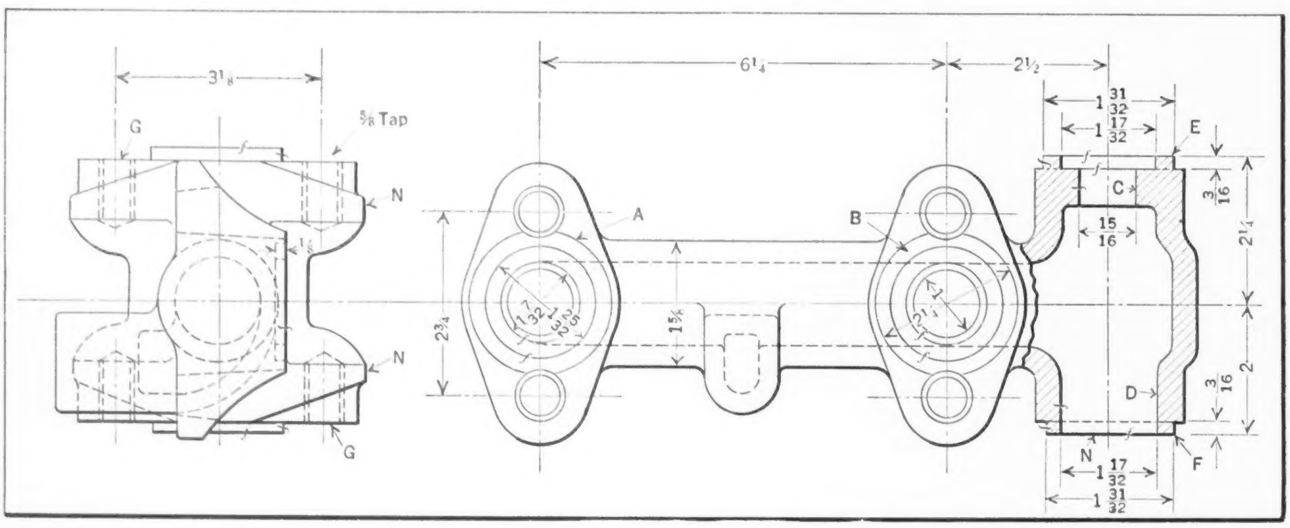


Fig. 2. Example of Work Machined in the Trunnion Type Fixture Shown in Figs. 1 and 3

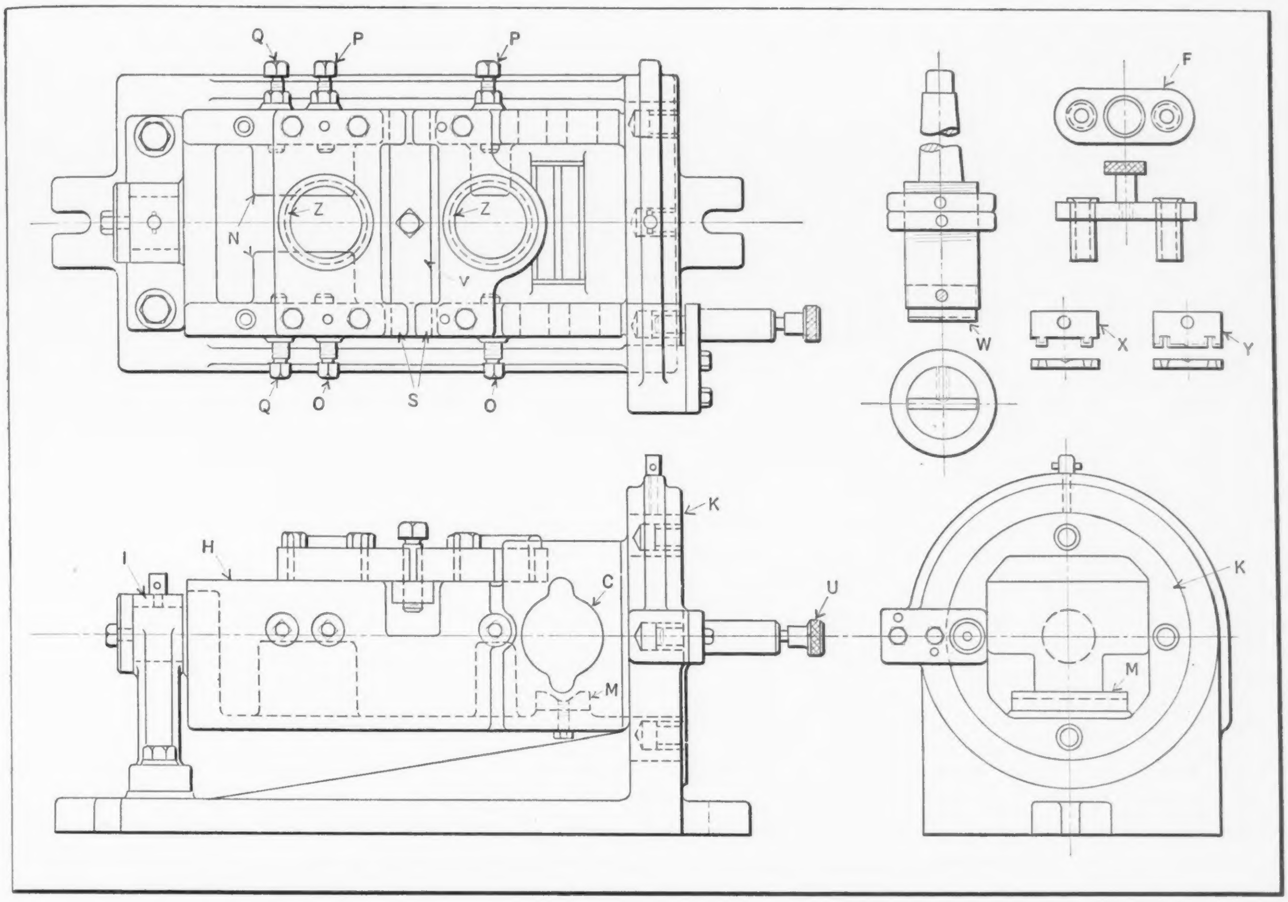


Fig. 3. Details of Fixture Shown in Fig. 1, and Tools Used in Machining Part Shown in Fig. 2

in drilling the holes *C* and *D*, Fig. 2. The tapped holes *G* were so close to the machined surfaces *E* and *F* that it was impossible to use drill bushings of the usual type in drilling them. This difficulty was overcome by mounting two drill bushings on a plate or holder *F*, Fig. 3, which is provided with a knurled handle to facilitate removal.

* * *

Qualifications of Salesmen

Among the personal qualifications in the sales force that are most important under present conditions are, first, courage, and second, hard work, according to Frederick B. Heitkamp, general sales manager of Cincinnati Milling Machine and Cincinnati Grinders, Inc., in an address on "Industrial Sales Management for Present Conditions" before the Industrial Marketing Conference of the American Management Association. Additional qualifications listed by Mr. Heitkamp were vision, optimism, loyalty, willingness, perseverance, a sense of humor, good health, and the combination of a forceful but sympathetic temperament. "Conditions that we have experienced during the last two years have automatically eliminated the order-taker" said Mr. Heitkamp. In discussing the matter of compensation of salesmen, he said that at present a base salary with a commission is probably the most satisfactory method.

Shop Practice One Hundred Years Ago

At a meeting of the Newcomen Society in London, a recently discovered diary of Joshua Field, who, in August and September, 1821, made a tour of the work-shops and factories in England, was brought to the attention of the members. Field was associated with Henry Maudslay, the well-known British engineer and machine tool builder of the early nineteenth century. In 1822 he was made a partner in the firm of Maudslay, Sons & Field.

Many of the entries in the diary throw an interesting light upon industrial conditions of that day. In one instance, he visited a machine shop in which about a dozen men were at work. The power for driving the machinery was man power, furnished by three men whose wages were 11 shillings a week; the pay of the mechanics varied from 26 to 30 shillings a week.

In another shop he was attracted by "a fine vertical boring machine that was capable of boring 8 or 9 feet in diameter and 12 feet long; and a lathe very well made and finished, and kept very clean, on which a multitude of wheels all nicely pitched and trimmed behind the mandrel gave motion to the lathe, all covered over by plates in panels neatly done."

Further, he found that "in a small building they have a grinding mill where they grind all their bright work, and I saw some round rods done so well that they seemed to have been turned."

Ingenious Mechanical Movements

Mechanisms Selected by Experienced Machine Designers as Typical Examples Applicable in the Construction of Automatic Machines and Other Devices

Mechanism for Feeding Six Shells per Second

By JOSEPH WAITKUS

Container caps like that shown in the lower left-hand corner of Fig. 1 are provided with a cork disk which is glued to the inner bottom surface. A machine has been built for gluing and inserting the disks and drying the glue at the rate of six disks per second. The shells are made of ordinary thin tin plate, and because of their frail nature, are easily distorted under relatively light pressures. This characteristic, together with the high feeding rate required, made the design of a suitable feeding mechanism for automatically carrying the shells through the machine a difficult problem.

After a good deal of experimenting, the feeding

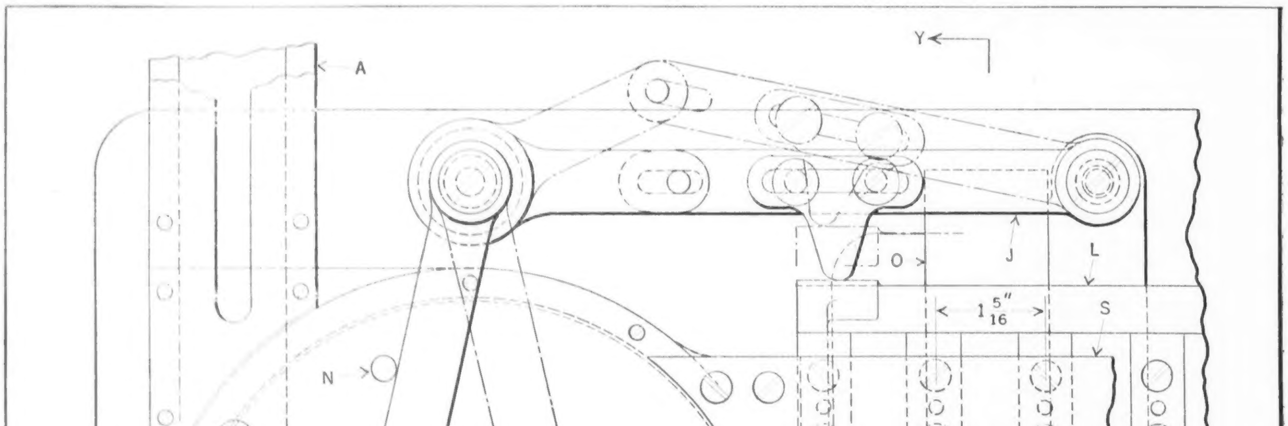


Fig. 1. Disk-feed End of a Combined Disk and Transfer Feed Mechanism. Shells are Pushed from the Disk to the Transfer Feed which Carries the Shell to the Work Stations

arrangement shown in Figs. 1, 2, 3, and 4 was found to provide a continuous and smooth flow of shells. As each shell passes the various work stations (not shown), it is confined positively between separating fingers, so that there is little danger of distortion resulting from jamming or other causes.

Briefly, the shells are fed from a hopper (not shown) down through the chute *A* to the constantly rotating friction disk *B*. The disk is driven at about 180 revolutions per minute by a pair of spiral gears, one of which is indicated in Fig. 3 on the disk shaft. A stationary guard *C* of built-up construction, secured to the machine casting, has a channel *D* in it, ending at *E*, which is a continuation of the chute. Thus the rotary action of the disk causes the shells from the chute to enter and fill this channel. Slots are cut through the top of guard *C* to permit inspection of the shells passing through the channel.

As each shell reaches position *F*, it is fed by the pusher *G* between the first four fingers of the longitudinal feeding arrangement shown at the right of the disk. The movement of pusher *G* is obtained through bellcrank lever *H* and link *J*, which is pivoted at the right-hand end to a stationary projection on the machine. An adjustable lug secured to the link is held in contact with the finger-bar *L* by means of the coil spring *M* (Fig. 3). Finger-bar *L*, as explained later, is given a reciprocating movement parallel to chute *A*. This movement is transferred through the lug, link, and bellcrank lever to the pusher. Stationary pin *N* limits the movement of lever *H*.

During one cycle of the machine each shell in the longitudinal feeding arrangement must move to the right, between the next set of fingers. This feeding movement is obtained through a rotary movement of finger-bar *K* and a reciprocating movement of bar *L*. The rotary movement of bar *K* is obtained through the cranks *P* driven through

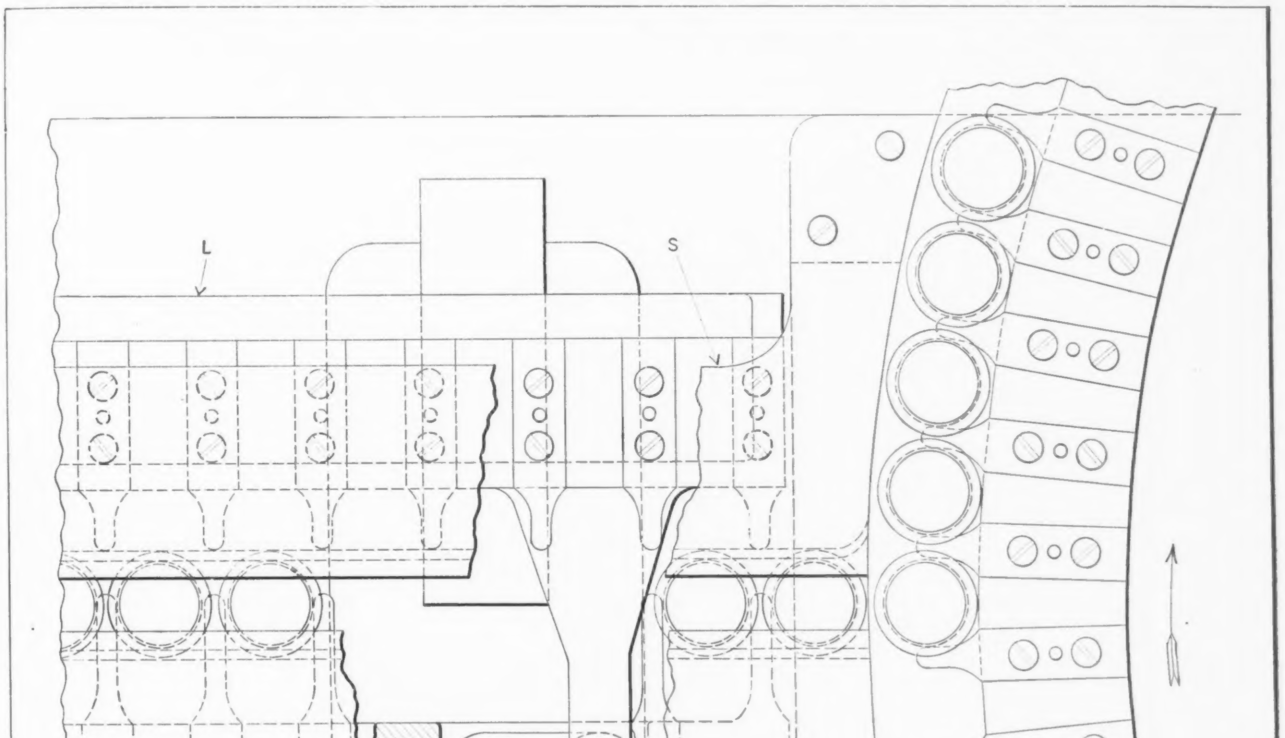


Fig. 2. Right-hand End of Feed Mechanism, Showing how Shells are Delivered from the Transfer Feed to a Rotating Drum where Other Operations are Performed

spiral gears by another member of the machine. The throw of these cranks is equal to the longitudinal spacing between the fingers on bars *K* and *L*. Thus, as the cranks rotate one revolution, bar *K* is given a combined parallel and rotary movement, so that any point on this bar will follow a circular path.

Finger-bar *L*, however, is merely reciprocated in a direction at right angles to the longitudinal feeding movement of the shells, being guided by the slot *O*. Bar *L* is actuated by bar *K* through the arms *Q*. Rollers at the outer ends of these arms engage elongated slots in bar *K*. Hence, as bar *K* rotates, it causes bar *L* to reciprocate.

The shells, in passing along the longitudinal feed, are confined in a straight path by the guides *R* and *S*. These guides also serve to hold the finger-bars *K* and *L* down on the flat bearing surface of the machine frame. The various positions of both bars and the corresponding crank positions during one cycle of the machine are indicated in Fig. 4. This illustration clearly shows the manner in which the shells are transferred from one set of fingers to the next.

The function of bar *L* is to align the shells for the operation, while bar *K* serves to move each shell to the succeeding station. When a shell is ejected from the friction disk by pusher *G*, the finger-bar *L* has not quite reached the position indicated at Position 1, Fig. 4. That is, bar *L* is back

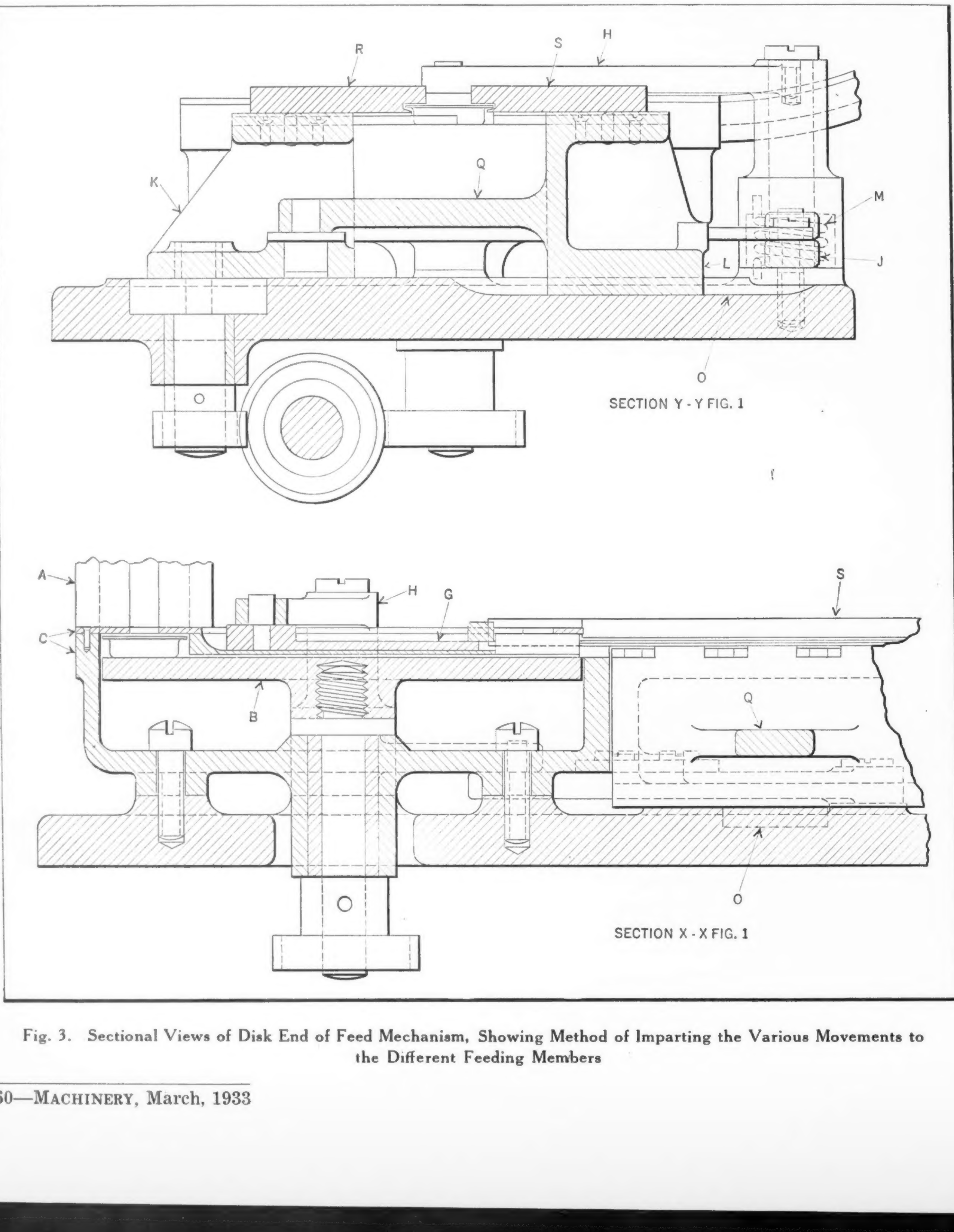


Fig. 3. Sectional Views of Disk End of Feed Mechanism, Showing Method of Imparting the Various Movements to the Different Feeding Members

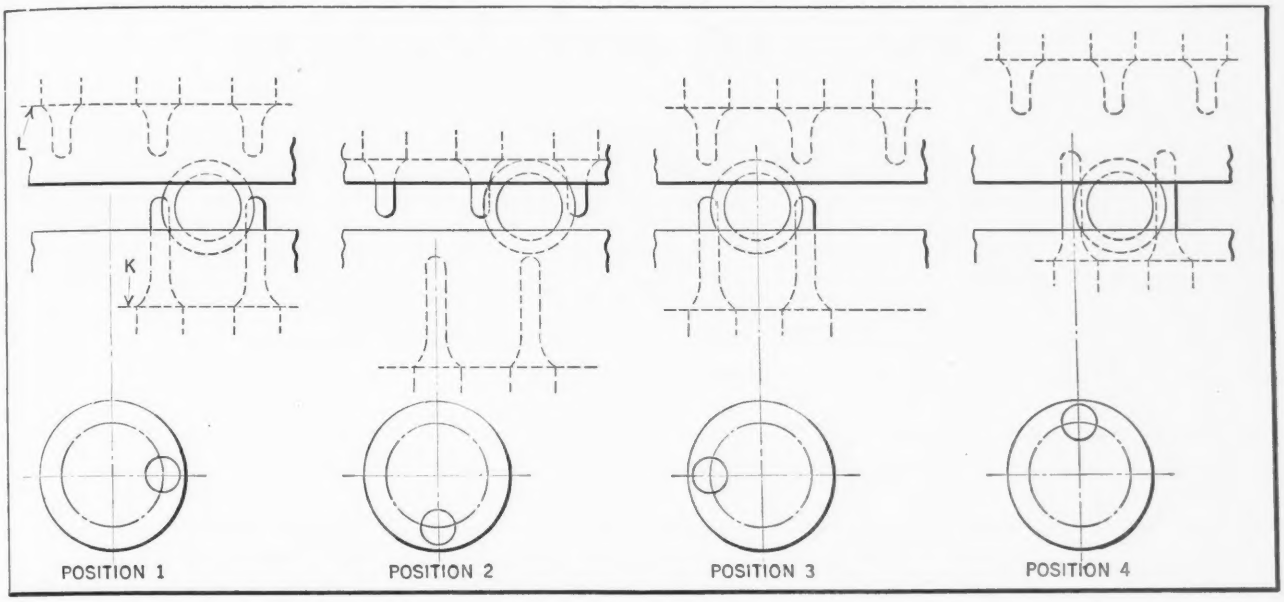


Fig. 4. Diagram Indicating the Various Positions of the Longitudinal Feed-bars and Cranks during One Cycle

far enough to allow the shell to pass the first finger in this bar. Bar *L* then moves forward, as indicated at Position 2, and locates the shell, after which the required operation is performed.

During the next quarter movement (Position 3) of the cranks, the fingers on bar *L* move back and those on bar *K* move in at each side of the shell. Continued rotation of the cranks causes the fingers on bar *K* to move the shell along the guides to the succeeding station (see Positions 4 and 1). The fingers on bar *L* then advance to hold the shell in position for the next operation.

The right-hand end of the longitudinal feed is shown in Fig. 2. Here the shells are ejected between fingers spaced equally about a continuously revolving drum, the speed of which is synchronized with the longitudinal feeding movement. It is on this drum that the cork disks are fastened in the shells by the application of heat and pressure. The cork is inserted while the shell is traveling along between the guides *R* and *S*.

Owing to the rotary movement of bar *K*, it was necessary to make the last two fingers on this bar of the overhanging type to clear the right-hand end support for the shell guide *R*. It will be noted that the fingers on bar *L* are shorter than those on bar *K*. This is necessary in order to allow the ends of the fingers on bar *L* to clear the shells just before the shells are fed along guides *R* and *S* by the fingers on bar *K*. This clearance could have been maintained by making the fingers of both bars the same length and locating the bar *L* farther away from bar *K*. It is desirable, however, that the distance between the bars be as short as possible.

Electric Furnace Brazing

A new method of joining metal parts has recently been developed to a high degree of perfection. This is the electric furnace brazing method. It consists of passing the assembled parts through a controlled atmosphere electric furnace after copper wire has been applied near all the joints of the parts. When the copper melts in the reducing atmosphere, it runs into all the joints, and forms strong, tight bonds upon cooling. The reducing atmosphere takes the place of the flux used in other brazing methods, and has the advantage of keeping the parts clean and free from oxidation, so that further cleaning after brazing is unnecessary. An article in April MACHINERY by H. M. Webber, of the General Electric Co., will explain this process in detail and give complete directions for its application.

Questions and Answers

A Department in which the Readers of MACHINERY are Given an Opportunity to Exchange Information on Questions Pertaining to the Machine Industries

S. A. A.—Can any of the readers of MACHINERY give me information regarding the best method of removing the burr or roughness on one side of a gear after the hobbing operation has been performed? Have sand-blasting, scratch-brushing, or tumbling been found to be satisfactory methods of accomplishing this? The experience of others along these lines would be of value.

Modulus of Elasticity of Chromium Steels

F.T.—Should the modulus of elasticity for chrome-vanadium and chrome-nickel steels be assumed to be 30,000,000, the same as for regular spring steel?

A.—According to the International Nickel Co., Inc., tests reported by different investigators on the modulus of elasticity of both ordinary carbon and alloy steels show a considerable range variation. For this reason, it is difficult to draw definite conclusions as to the effects of alloying elements on the so-called "modulus of elasticity." The following results, however, are said to be based on careful determination: Carbon steel, 29,500,000; nickel-chromium steel (nickel, 1 to 3 per cent; chromium, 0.60 to 1.5 per cent), 29,000,000; stainless steel (chromium, 18 per cent; nickel, 8 per cent), 28,300,000.

Are "Dollar Contracts" Binding Without the Payment of a Dollar?

P. R. P.—Is a contract or agreement legally binding in New Jersey when the contract specifies "one dollar and other valuable considerations" and the contracting party fails to actually pay one dollar to the other party or parties? Would not this failure of payment technically nullify the agreement? Also, what is the legal effect when the party having failed to turn over the dollar is suspected of double dealing, and the "other valuable considerations" are opposite of "valuable" and not beneficial to the other party?

Answered by Leo T. Parker, Attorney at Law
Cincinnati, Ohio

It is well settled law that a contract without consideration is void and unenforceable. Usually the Courts uphold the validity of a contract that specifies "one dollar and other valuable consideration." However, if it is proved that the "one dollar" actually was not paid, then this part of the consideration fails and may render the contract void, particularly if the "other valuable consideration" is not beneficial to the other contracting party. This is true because the word "consideration" legally means that it must be beneficial to the other contracting party or at least intended to be beneficial when the contract was signed.

Obviously, however, if the consideration appeared to be beneficial to the other contracting party and for some reason, not tainted with fraud, such consideration turns out to be detrimental, this fact alone is not sufficient to invalidate the contract. Of course, if the contracting party fraudulently or by misrepresentation made it appear that the consideration would benefit the other party when actually it would be a detriment, then the contract may be rescinded on the ground of fraud.

In a United States Court case [45 F. (2d) 428], a clause of a contract recited "one dollar and other good and valuable consideration." Since it was not proved that the one dollar was paid and "other good and valuable consideration" was not good or valuable, the Court held the contract void, and said:

"The $1 consideration recited in the paper is nominal. It cannot seriously be urged that $1, recited but not even shown to have been paid, will support an executory promise to pay hundreds of thousands of dollars. 'Other good and valuable considerations' are generalities that sound plausible, but the words cannot serve as consideration where the facts show that nothing good or valuable was actually given at the time the contract was made."

* * *

Machinery Parts Sent by Air Express

Machinery parts urgently needed as a result of breakdowns constitute an increasing percentage of the shipments sent by air express. As an example may be mentioned the case of a Cleveland manufacturer who was enabled to supply a repair part to a town in Texas overnight. The Bruce-Macbeth Engine Co. of Cleveland sent a package of valves weighing 15 1/2 pounds from Cleveland at 4:50 P.M. The package reached Dallas, Texas, the following morning at 7:10 A.M., having been transferred from one plane to another at Chicago the previous evening. Numerous examples of this kind could be cited to indicate how air express service may be used to advantage in cases of urgent need for repair parts. There are also cases where a combination of air express and rail has been found advantageous.

Drilling a Two-Piece Lever Designed for Quick Replacement

By S. A. McDONALD

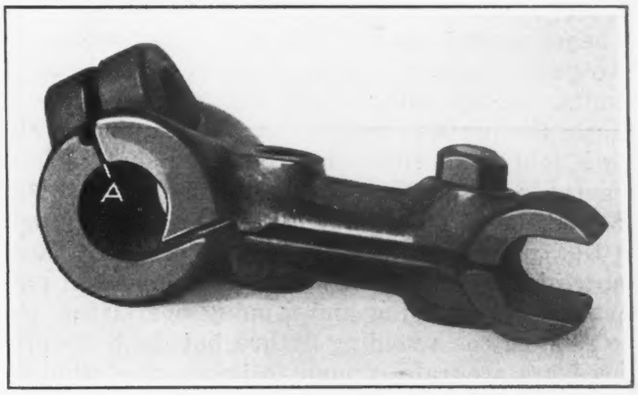


Fig. 1. Lever Made in Two Pieces to Permit Assembling on Shaft Without Removing Shaft

YOKE levers like the one at *W*, Fig. 2, functioned satisfactorily until the machines on which they were used became jammed. When this occurred, the levers were broken and the dismantling of a large part of the machine was necessary in order to replace them. To make such replacements a simple matter, the yoke lever was redesigned to be made in two parts, as shown in Fig. 1. Pads that could be finished quickly by disk grinding were provided where these two parts came together to simplify the machine work. Owing to the fact that the new yoke lever was made in two parts, the clamping slot *A* could be cast instead of being milled, as was done in the original lever. This made the slotting fixture useless, and it was necessary to make a new drill jig (see Fig. 2).

The drill jig has a cast-iron frame *B* with three sets of feet for supporting the work in three different positions for drilling the necessary holes. The three ribs (shown in cross-section) that join the sides of the frame serve as seats or locating points on which the two-piece yoke is clamped. Rectangular holes in the sides of the frame *B* are fitted with the wedge *C*, which is used to hold the two parts of the yoke lever together, as well as to clamp them down on the locating seat.

The two-piece yoke lever to be drilled is placed

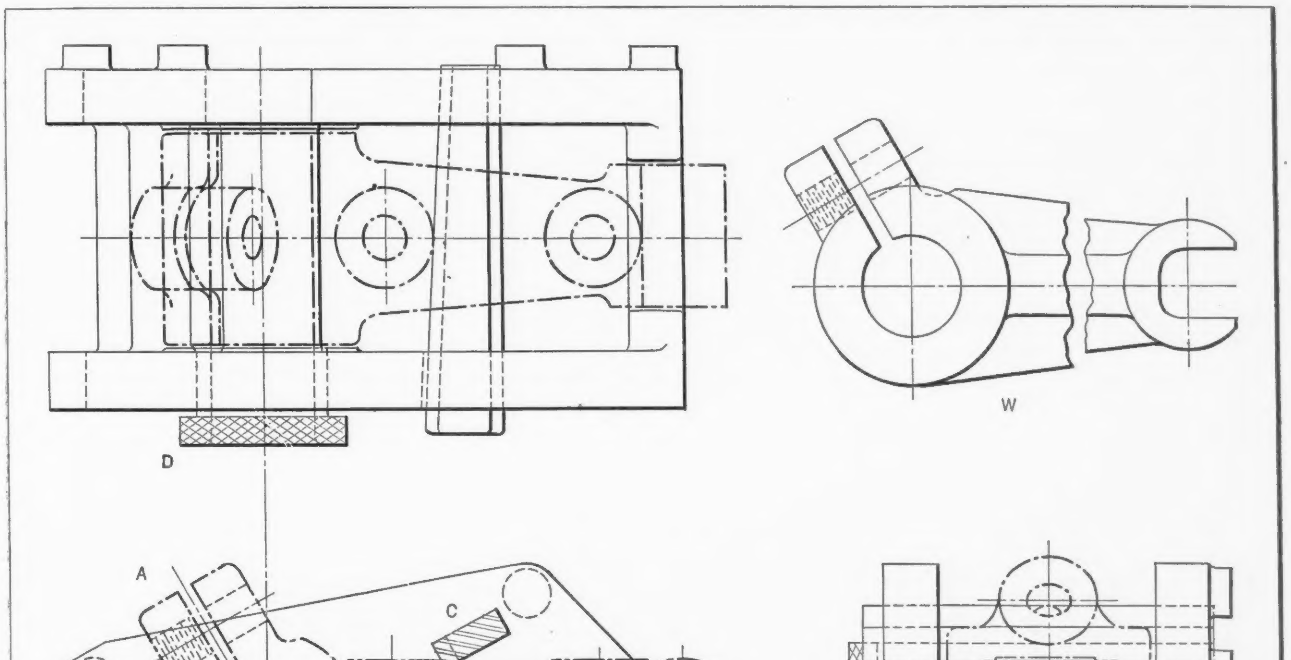


Fig. 2. Jig for Drilling a Two-piece Lever Designed to Replace the Solid Lever W

in the jig and the wedge C is put in place so that it bears against the bolt-hole boss, thus forcing the two parts together and against the three locating points. A tap with a light hammer on wedge C causes the parts to be held securely in place. The jig is laid on its side while the cored shaft hole is reamed to size through the bushing D. The positions of the bolt-holes are located by cast-in depressions in the centers of the bosses to be drilled. These depressions are made by countersinking the pattern. In the drilling and tapping operations, the jig acts only as a holding fixture, but the holes produced are accurate enough to insure the required interchangeability.

A light blow on the small end of wedge C serves to release the work so that it can be removed from the jig. The principal feature of this jig is the rapidity with which it can be loaded and unloaded. Other advantages are the clearance provided for chips, absence of pockets that will catch chips, and low cost of construction.

Auxiliary Miller Table for Backing off Radial Slots

By WILLIAM C. BETZ, Master Mechanic
The Fafnir Bearing Co., New Britain, Conn.

There are times when it is a great convenience to be able to set the index-centers at an angle to the direction of travel of the miller table in order to back off radial slots in a piece such as shown at A in the illustration.

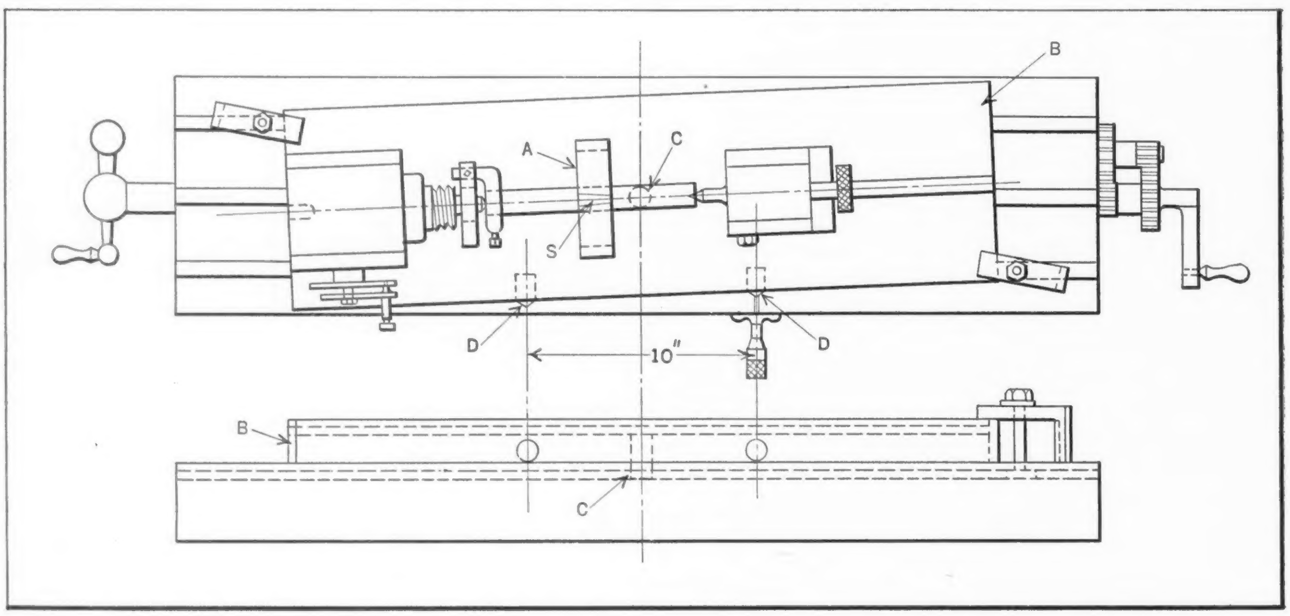
At first, it might appear that such work could be done on a universal milling machine by shifting the table to the angle required. However, if the miller table is shifted on its saddle, the cutter will produce a "skew" formed slot, as the ways of the table will be traveling at an angle to the center line of the cutter. What we want to do is to cut a kerf at an angle to the work face without side interference of the cutter, and this can be done only by having the miller table travel at right angles to the cutter and arbor while the index-centers are set at an angle on the miller table. This is best accomplished through the auxiliary table B, which can be swung around the fulcrum stud C, as shown.

The auxiliary table should be about 8 inches shorter and 2 inches narrower than the miller table, and should have one T-slot cut in it lengthwise. This T-slot should have the same dimensions as the slots in the machine table and should be parallel with the sides of the table. Two buttons D, set 10 inches apart, provide for setting the auxiliary table B to the correct angle by the sine bar method. These buttons are made exactly the same length, and the required measurements are made with a vernier or micrometer depth gage. The base of the gage is placed against the side of the miller table so that the contact pin touches the top of the buttons. The auxiliary table is clamped in place with straps at each end of the machine table as shown.

The piece A to be milled is a slot-piercing die which must be very accurately indexed. The backing off of the slots S must either be done by filing, which is slow, or by milling, which is quicker and much more accurate, especially when the auxiliary table is used. The slots to be milled are backed off on one side by the first series of cuts, the auxiliary table with the index-centers in place being swung to one side. The other side of the slots is then backed off, the second series of cuts being taken with the auxiliary table swung to the other side.

* * *

There is no success where there is no chance of failure.—*The Shop Review*



Auxiliary Milling Table that can be Swung about Fulcrum Stud for Taking Cuts at an Angle

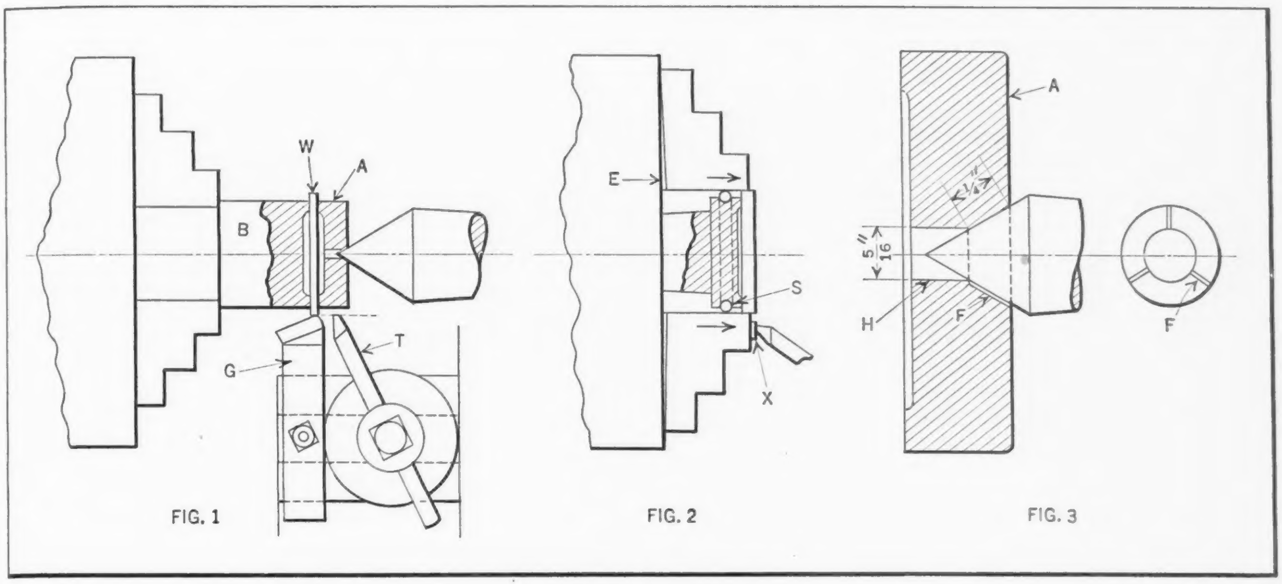


Fig. 1. Equipment for Truing up and Turning Periphery of Disk. Fig. 2. Chuck Equipped for Facing Thin Disk. Fig. 3. Details of Plate A, Fig. 1

Turning and Facing Thin Metal Disks

By M. JACKER

THE equipment shown in the accompanying illustration for turning and facing thin disks can be used to advantage when not more than a few thousand disks are required. If the disks are cut from round stock more than 1/64 inch larger than the finished diameter, the bars should be rough-turned to within 1/64 inch of the finished size before the disks are cut off on a hacksaw or cutting-off machine. If the disks are to be machined on the periphery only, they can be held between two clamping pieces, as shown in Fig. 1. In this view, disk *W* is shown clamped between pieces *A* and *B*. Piece *B* is made with a slight shoulder to prevent it from being pushed back into the chuck.

Piece *A* is centered so that it will revolve on the tailstock center. Both *A* and *B* are turned to a diameter slightly less than the finished disk. As the work is held by frictional contact, it is very important that the clamping pressure be concentrated near the edge. Accordingly, the clamping pieces are relieved, as shown, so that they have a narrow clamping rim at their outer edges. Three oil-grooves are filed in the center bearing of piece *A*, as shown at *F*, Fig. 3. Cup grease or white lead and oil with a little graphite mixed in is used to lubricate the center.

Fig. 3 shows a center suitable for turning disks from 2 to 4 inches in diameter. The hole at *H* provides the relief required for the point of the lathe center when a disk occasionally runs out of true because the sides are not parallel. The clearance hole also prevents the center bearing from being spoiled and assists in equalizing the clamping pressure on the work, so that it will be held firmly on the thin as well as the thick sides. Of course, the faces of all disks should be machined parallel and given the proper degree of finish before finish-turning the outside. If the disks have a high finish, strong pieces of manila paper should be glued to the faces of the clamping pieces *A* and *B*.

The device shown at *G*, Fig. 1, is provided for the purpose of truing up the disk between the pieces *A* and *B* before taking the finish-turning cut. This device is made of flat stock, about 1/4 by 1 inch in size. If space permits, a lighter piece may be clamped in the toolpost over the turning tool in place of piece *G*. The work to be trued up is clamped lightly between the pieces *A* and *B*, the lathe started, and the carriage moved to the left to bring the outer edge of the work into contact with the truing device *G*. The device will gradually true up the work so that it runs concentric with the center of the lathe spindle. The tailstock center is then tightened enough to hold the work more firmly while the finish-turning cut is taken. After once being set, this equipment will center and finish a great many disks to the correct size without requiring further adjustment.

A geared three-jaw chuck, equipped as shown in Fig. 2, provides a very good means for holding the disks while taking a facing cut. When the jaws are tightened down upon a piece of work, the clearance in the jaw slides, together with a certain amount of spring, allows the jaws to be pushed away from the

face of the chuck at point E. Often, when this occurs, it seems impossible to knock or force the disk up square against a stop.

To overcome this trouble, one coil of about 1/4-inch diameter spring wire, having an outside diameter a little larger than the disk to be chucked, is placed directly in back of the work in a retaining groove in the stop, as shown in Fig. 2. When the jaws are closed, the spring S forces them out at the gripping end before they come in contact with the work. Consequently, there will be no further motion of this kind to force the disk away from its stop. A gage-block at X for setting the facing tool is a great convenience in handling work of this kind.

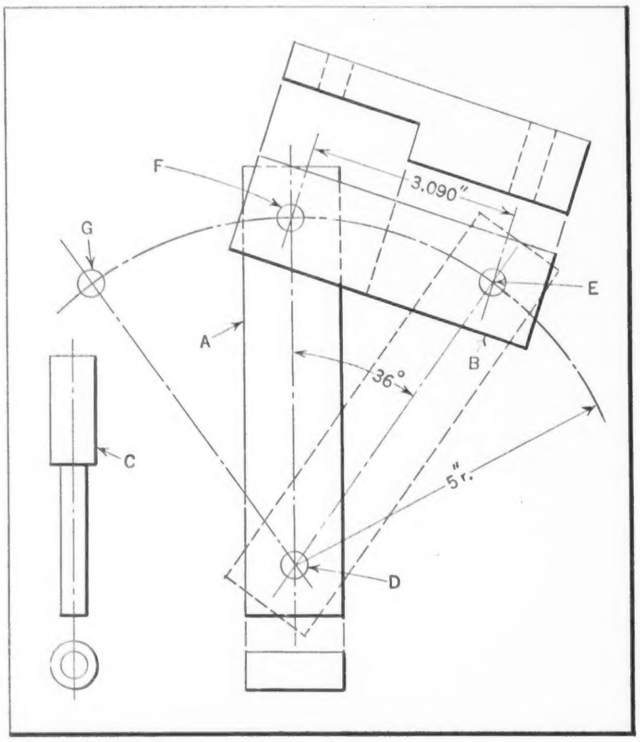
Simple Method of Spacing Holes on a Circle

By E. E. KEELER

The simple and inexpensive equipment here illustrated, for spacing holes on a circle, has been employed by the writer for a great many years. The method of making and using it can best be illustrated by describing a typical application.

Let us assume that ten equally spaced 7/8-inch holes are to be drilled on a circle 10 inches in diameter. This gives an angular spacing of 36 degrees and a chordal distance between holes of 3.090 inches. This distance may be calculated or obtained from a table such as is found on pages 77 to 79 of the eighth edition of MACHINERY'S HANDBOOK.

The piece A is made of cold-rolled stock, and is 1/2 inch thick, 1 1/2 inches wide, and 6 1/2 inches long. Both sides of this piece are ground smooth and parallel. The two 7/8-inch holes are located 5 inches between centers. Piece B is made from cold-rolled stock, 1 inch thick by 1 1/2 inches wide. Both sides of this piece, also, are ground, and the two 7/8-inch holes are located 3.090 inches between centers. One end is milled or cut away as shown, the cut away portion being ground to a depth that will exactly match the thickness of the piece A.



Evenly Spaced Holes are Drilled on a Circle by Having Block A Maintain Radial Positions and Block B Establish Chordal Distances

Two studs C are made up with their small ends finished to a wringing fit in the holes in pieces A and B. One of the studs C is passed through the hole D of piece A and into the bushing or hole at the center of the circle about which the accurately spaced holes are to be drilled. If the work is of such a nature that a hole cannot be drilled at the center of the circle, a center hole can be drilled in a block temporarily secured to the work.

The first hole in the work is drilled at point E, using the hole at the outer end of piece A as a guide for the drill, piece A being positioned as shown by the dotted lines. The second hole F is then located by means of the pieces A and B. Piece A is swung into the position shown in full lines by pivoting it about the stud at D. One of the studs C is used to locate the hole in the thick end of the piece B in line with the hole drilled at E. The two holes in the free ends of the pieces A and B will now give the correct spacing for the hole at F.

The hole at G and the remaining evenly spaced holes are all positioned in the same manner, using piece B to obtain the proper spacing between the successive holes. The accuracy of the spacing of the pins depends, of course, upon the accuracy with which the holes are located in pieces A and B. When these pieces are to be used a great many times, the holes should be provided with bushings.

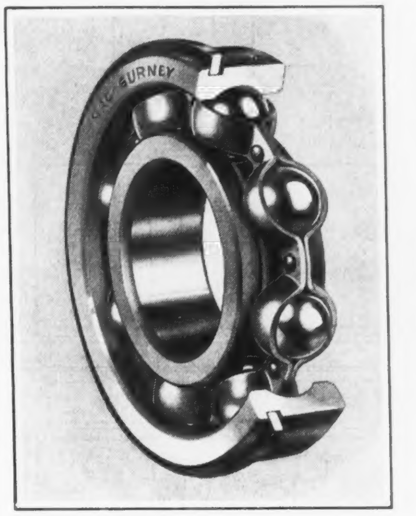
* * *

Rubber is useful in many ways to eliminate noise. Here is a new one. A 3/4-inch hydraulic pipe in one of the buildings of the B. F. Goodrich Co., Akron, Ohio, developed a noisy water-hammer. The trouble was remedied by substituting a piece of 3/4-inch rubber hose for a section of the pipe.

Simplified Method of Mounting Anti-Friction Bearings

By THOMAS BARISH
Assistant Chief Engineer
Marlin-Rockwell Corporation

THE complication of mounting an anti-friction bearing usually adds materially to the cost of the bearing and sometimes prohibits its use. With the aim of reducing installation costs in certain applications, the Marlin-Rockwell Corporation, Jamestown, N. Y., has brought out a bearing of the design shown in Fig. 1. Essentially, this is a standard Marlin-Rockwell single-row bearing with a groove cut in the periphery of the outer race. This groove accommodates a snap ring which will take thrust in one direction, thus eliminating the need of providing a housing shoulder against one side of the outer race. Because of its outline, the name "G Type" has been given to the new bearing.



Several advantages are derived from the design of the new bearing: (1) The outside diameter can be centerless-ground straight across; (2) the bearing can be chucked in standard fixtures for grinding the ball path; (3) the narrow portion of the outer race seat can be used for centering an end cover; and (4) the bearing will take a certain amount of thrust in both directions.

The Bearing Has Made it Possible to Reduce the Length of Automobile Transmissions

The G type bearing was developed for use in automobile transmissions. The new design enables the bearing bores in the transmission case to be machined straight through by means of a floating reamer, since housing shoulders are not required. Although the front and rear holes in a transmission case are usually of different sizes, reamers for both holes can be mounted on a single bar and the two holes reamed at the same time, accurately in line and parallel.

Another important advantage in this application is that with this bearing, a reduction of from 1/2 to 3/4 inch can be made in the over-all length of the transmission case and in the over-all shaft length. Because a housing shoulder is not necessary, the front bearing can be brought closer to the first gear. This will be apparent from Fig. 2, where a transmission with ordinary ball bearings is shown in the upper view, and one with bearings of the new type in the lower view. The new bearings can be allowed to project slightly from the housing, and their ground race faces can be brought closer to the gears than the rough cast surface of the transmission case. These advantages are not so important at the rear end, because the housing shoulder required with standard bearings can be made to dovetail into the large low-speed gear.

A further saving in the length of the transmission case is accomplished by centering the end cover of the case on the projecting outer bearing race instead of extending the housing to provide a centering lip. At the rear end, this also permits the speedometer worm to be placed closer to the bearing and reduces the overhang of the universal joint.

When the transmission design shown in the lower view of Fig. 2 is used with spiral gears, the thrust from the gears is transferred to the case through the outside ground face of the outer race. The snap ring and groove of the bearing are called upon to carry only the small reverse thrust that occurs when the automobile coasts in gear.

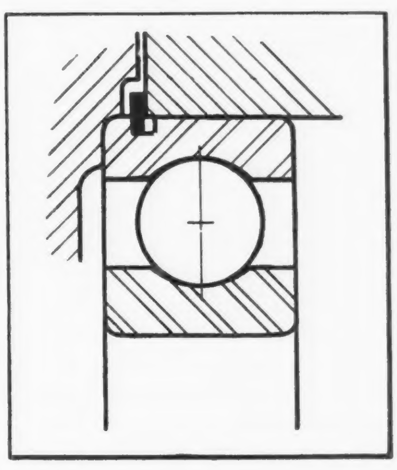


Fig. 1. G Type Ball Bearing Designed for Assembly in Holes Bored Straight Through

Applying the Bearing to Machine Tool Gear-Boxes

The G type bearing is particularly applicable in certain machine tool gear-boxes, especially when the bearings are mounted in a center web and the shoulders or counterbores ordinarily required would be difficult to machine and measure. The inside bearings of a gear-box may be of a standard type, locked on the shafts and permitted to float endwise in straight holes in the housing. At the outside end, G type bearings could be used, as illustrated in Fig. 3, to carry thrust in both directions. Since the holes for these bearings

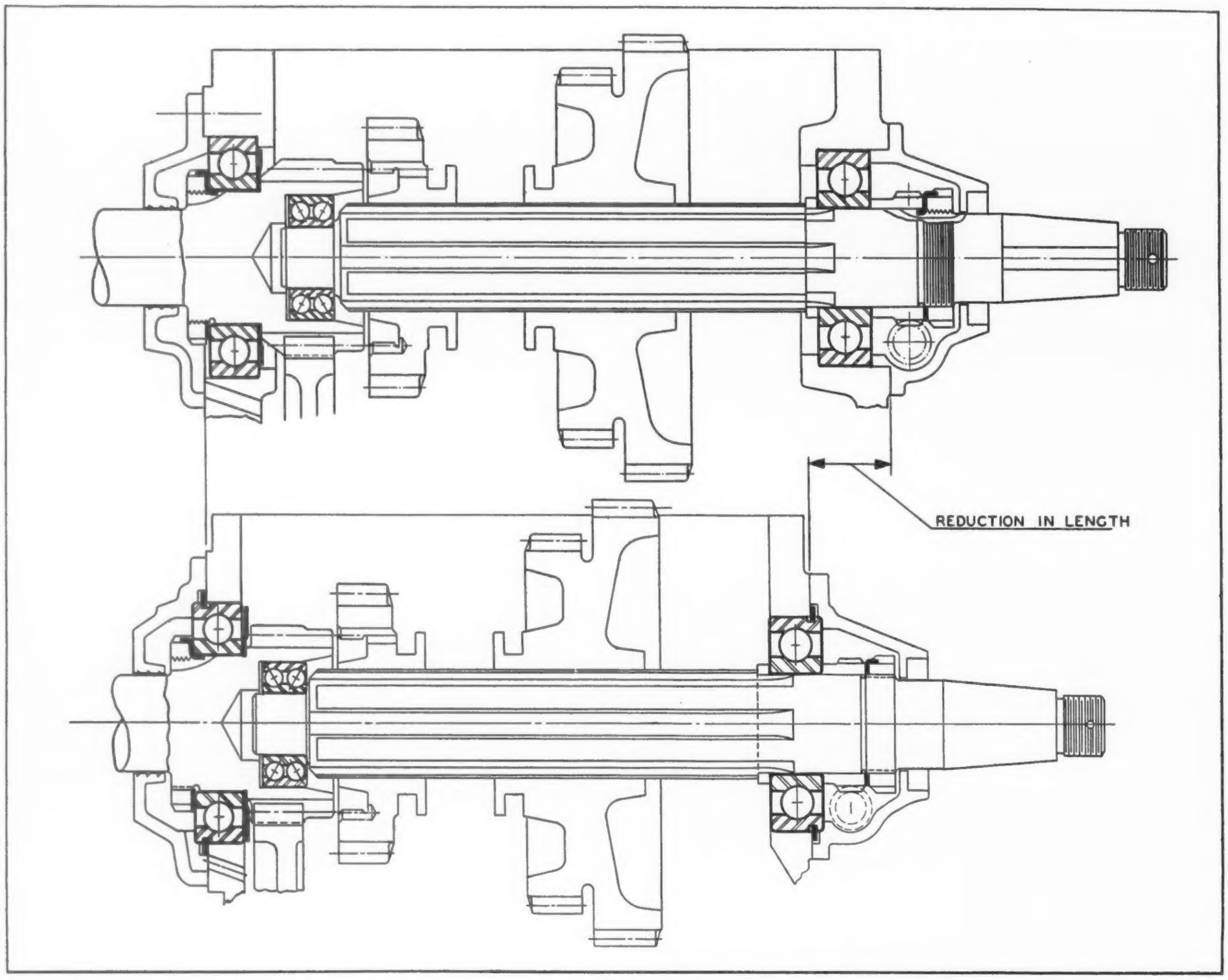


Fig. 2. Diagrams Illustrating How G Type Bearings Simplify the Machining of Automobile Transmission Cases and Enable a Reduction to be Made in Their Length

are also straight, the entire machining of the case would consist of surface milling and straight-through boring. The only shoulders or counterbores necessary would be in the small and easily machined end cover *A*. At the closed end, the cover need not be centered.

Heavy thrusts from spiral and spiral-bevel gears can be carried by providing a double-row ball bearing for the inner end of the shaft, that is, the end opposite the one on which the G type bearing is used. Certain machine tools require gear-boxes with flush side surfaces. In such installations, recessed end covers, such as shown in Fig. 4, can be used in conjunction with G type bearings. However, a

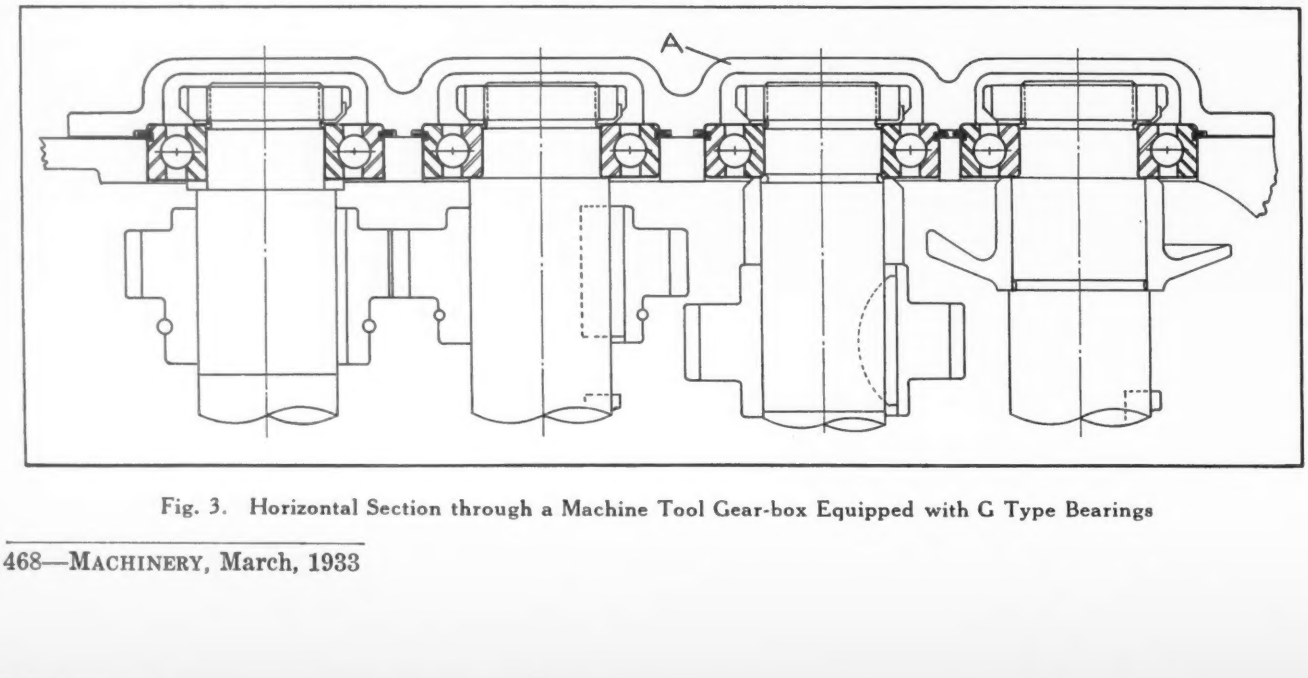


Fig. 3. Horizontal Section through a Machine Tool Gear-box Equipped with G Type Bearings

counterbored hole then becomes necessary, and the advantage of the new bearing is not quite so great as in the other examples mentioned.

Fig. 5 shows a design in which two G type bearings are opposed to each other. The inside faces of the casting must be machined flush, but on the other hand, lock-nuts or end covers are not required. In assembling such a unit, the bearings and gears are inserted and the snap rings dropped into place as the last step.

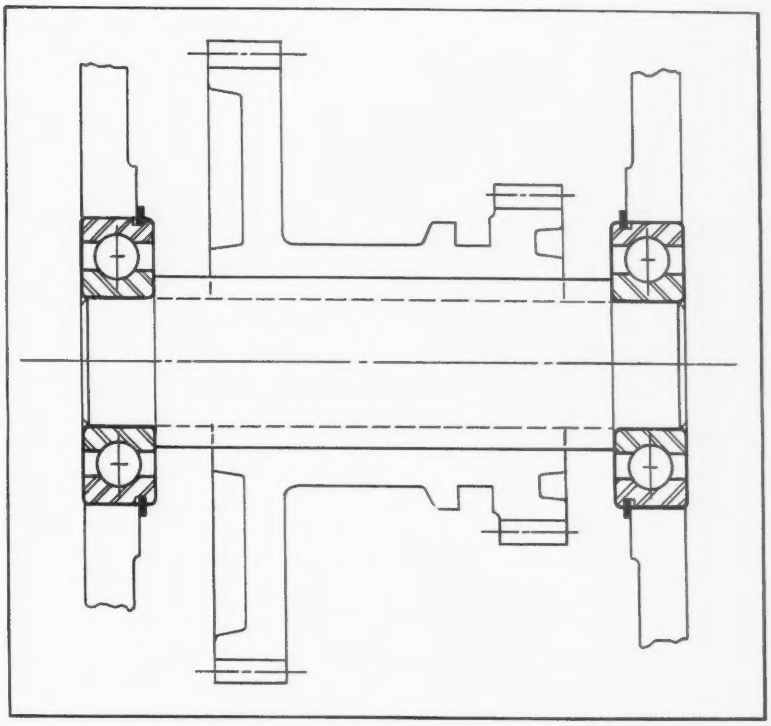


Fig. 5. Two G Type Bearings in an Opposed Relation to Each Other do not Require Lock-nuts, Housing Shoulders, or End Caps

Precautions to be Observed in Applying the Bearings

A considerable thrust load can be carried by the G type bearing if the thrust comes against the face of the outer race, but heavy loads should not be applied to the snap ring, because it fits quite loosely in a turned groove. Tests have been made with heavy thrust loads on the snap ring, but the application cannot be recommended until there has been more actual field experience.

So far, the new bearing has not been used for heavy radial loads, because the outer race is weakened slightly by the groove, and, of course, some of the seat is lost. To counteract this disadvantage, however, the housing hole is usually bored more accurately than is customary, and the amount of seating surface lost is reduced by making the corner radii of the bearing as small as possible. If minimum end play is essential in an application, a small amount of shimming must be used. Paper gaskets, such as are employed for a lubricant seal, can be used in duplicate where the looseness is considerable.

* * *

Last year, 183,000 motor vehicles of American make were sold outside of the United States.

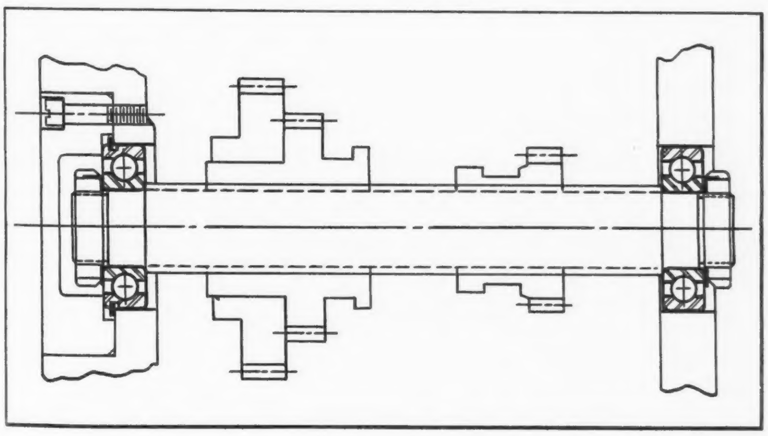


Fig. 4. Manner in which the Bearings Can be Installed when the Gear-box Must be Flush along the Outside

Reports on Mechanical Power Transmission

The American Leather Belting Association announces that it will publish a series of fifty weekly reports on mechanical power transmission from electric motors to the driven load. These reports have been prepared by Robert W. Drake, a well-known authority on power-transmission problems. The reports are written for millwrights, maintenance men, and executives in industrial plants, as well as for those engaged in the distribution of mechanical and electrical power-transmission equipment.

The publication of these reports is sponsored by the American Leather Belting Association and the Mechanical Power Engineering Associates. Further information can be obtained by addressing the American Leather Belting Association, 41 Park Row, New York City. Broadly, the reports will cover the characteristics of driven loads, motors, belt transmission, short-center drives, group drives versus individual drives, fan drives, compressor drives, and the efficiency of belt drives.

* * *

Unless we are willing to say that we have already achieved the greatest possible comfort and material and cultural well being, we are on unsound ground when we say that technological development has progressed too far.—*George P. Torrence, President, Link-Belt Co., in the Chicago Daily Times*

Latest Diemaking Practice Used in a Chinese Plant

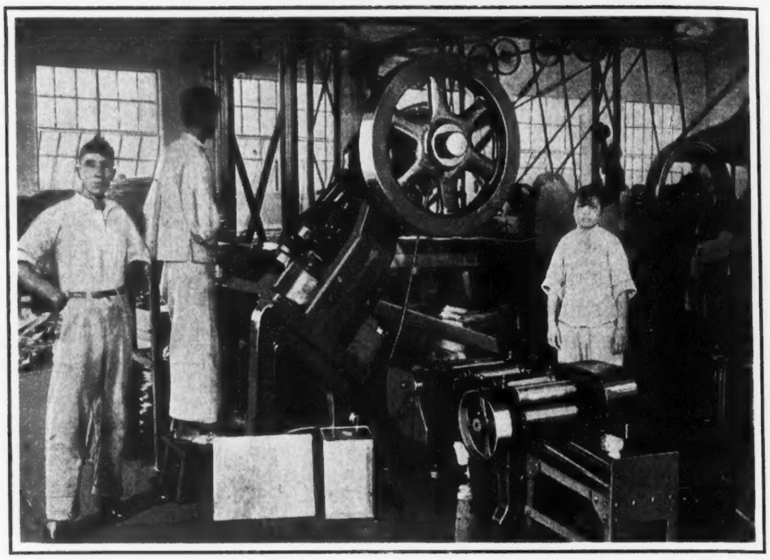


Fig. 1. Interior of a Chinese Plant, Showing a Trimming Press on which Hard-faced Dies are Used

Hard-Facing Dies with Stellite Has Increased the Die Life Fourfold without Adding to the Cost

HARD-SURFACING to restrict wear and increase the life of parts subjected to severe abrasion has been widely practiced in this country for a number of years. An interesting example of the application of this process has been made recently in the plant of a large company near Shanghai, China. Although it is not unusual to find modern American production methods employed in the Orient, this application is noteworthy in that it indicates the extent to which plants in China are adopting modern processes. The company referred to is engaged in fabricating kerosene oil cans and lanterns, and has considerably reduced its die costs by applying Stellite welding rod to the cutting edges of the dies.

In Fig. 1 is shown a trimming die in operation. Only the lower cutting edges of the die are hard-surfaced. The total cost of this die complete was approximately $135. The cutting edges of the lower knives were hard-surfaced to a depth of 3/16 inch at a cost of $15. To make these parts of tool steel would run to about the same figure, since tool steel costs approximately $1.50 a pound, whereas mild steel at 8 cents a pound was used as a base for the hard-surfacing material. The actual cost of the hard-surfacing material used amounted to approximately $5.

The bottom die and also the formed bottom of a kerosene can are shown in Fig. 2. The hard-surfaced lower cutting ring of this die is clearly shown in the illustration. It is estimated that a tool-steel ring would actually be more expensive than the ring with the hard-surfaced cutting edge, since the labor and machine work required in forming the ring from a blank plate would be considerable and a welded tool-steel ring would not be suitable. The cost of this die complete was $160. The rings cost $22, using about $9 worth of hard-surfacing material, while the cost of a tool-steel ring is estimated at $27.

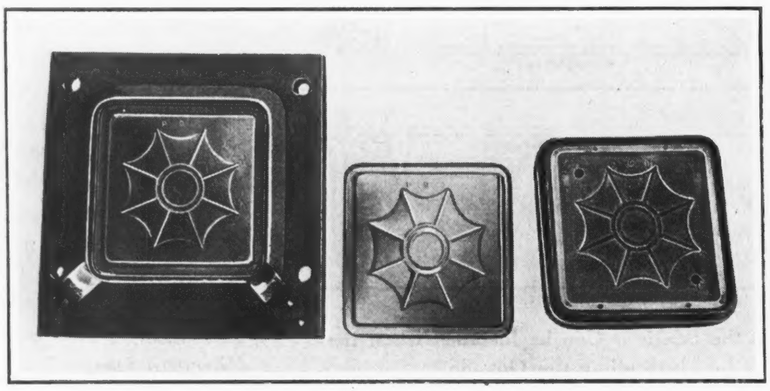


Fig. 2. Die with Cutting Edges Hard-faced with Haynes Stellite for Producing the Can Bottom Shown in the Central View

Fig. 3 shows the bottom part of a die for stamping and forming the tops of grease tins. The hard-surfaced cutting edge can be readily identified in the illustration. In front of the die is shown a finished container top. Hard-surfacing is also used on many other dies, including circular dies for stamping and forming lantern bottoms, arms, and fronts.

The cutting edges of these dies were hard-faced at no increase in cost over that required for tool steel, and their life was at least four times that of the usual tool-steel die. The hard-faced cutting edges of the trimming die, which may be considered as representative of all the dies, under normal working conditions, went for two months without grinding, making about 20,000 cuts a day. The total life of these dies was about two years. A tool-steel die required grinding at least once a week and had a total life of but six months. Thus the substitution of hard-faced dies for tool-steel dies re-

sulted not only in greatly prolonging the life of the die but also in cutting the grinding costs to about 11 per cent of their former values.

The abrasion-resistant Stellite was applied to the cutting edges of all the dies by means of an oxy-acetylene blowpipe, a welding flame containing a slight excess of acetylene being used. The steel base metal is not melted, but merely brought to a "sweating" heat on the surface, after which the rod is brought into the welding flame and the molten hard-facing metal allowed to flow over the base metal. This method of hard-facing is fast and easy to apply. Hard-surfacing has also found widespread use in this country for reducing costs through application to oil-well drilling tools, airplane tail-skids, cement grinder rolls, tractor treads, coke pusher shoes, plowshares, and innumerable wearing parts in almost every industry.

* * *

Engineering Conference in Chicago

Plans are being made for a huge engineering conference to be held at Chicago, Ill., during Engineering Week, June 25 to 30, under the auspices of the Century-of-Progress Exposition. Sessions will be held by the Society of Industrial Engineers, the American Society for Testing Materials, the American Institute of Electrical Engineers, and the American Society of Mechanical Engineers. About twenty national engineering societies will participate by holding sectional and national meetings.

Since most of the exhibits at the Century-of-Progress Exposition will be of a broad educational character, the Midwest Engineering and Power Exposition becomes an important part of activities of Engineering Week. At this Chicago power show, about four hundred companies will exhibit the latest equipment for the efficient production and utilization of power. In addition to power equipment, there will be many exhibits of interest to machinery manufacturers, such as electric motors and control, speed reducers, welding equipment, etc. The combined membership of the engineering groups participating in Engineering Week is 91,600. Preliminary estimates of attendance indicate the largest gathering of engineers in history.

Fig. 3. Stellite Die Employed in Forming and Stamping Tops for Grease Tins in a Chinese Plant

Gray Iron Investigations

Gray cast iron, unlike other structural metals, is not a homogeneous mass, but consists of countless small graphite flakes embedded in a metallic matrix, this matrix being essentially similar to a high-carbon pearlitic steel. The mechanical properties of gray cast iron vary not only with differences in composition, but also with different sizes of sections in an iron of a given composition.

To determine the effect of size of specimen on the mechanical properties of cast iron, a comprehensive test was made of one melt of iron. The specimens tested ranged in size from the standard American Society for Testing Materials' tension bar to one 4 inches square. In general, it was found that the tensile strength and hardness decreased, while the deformation per unit stress increased with an increase in the size of the specimen.

The results of this investigation are given in Bulletin 72 of the Engineering Experiment Station of the Ohio State University, Columbus, Ohio. Variations in elastic properties of the various specimens are shown by several sets of curves, while variations in structures are shown in a complete set of micrographs. The bulletin can be obtained without charge on application to the Director of the station.

Investigations of this kind are indicative of the service that the engineering experiment stations and the laboratories of some of our engineering schools are in a position to render.

* * *

Many industrial managers state that even if the volume of business in 1933 should be no greater than in 1932, there would be an increase in industrial employment, because the 1933 orders must be actually manufactured, while a large portion of the 1932 orders were filled from stock. Inventories are low, and hence there will be a need for more active manufacture. Should there be, in addition, even a slight increase in the volume of business, it would undoubtedly have a decided effect on increasing employment.

Hardening and Drawing Ford Drive Shafts by Improved Methods

A Double-Chambered Furnace and Improved Quenching Equipment are Features of the Process Used in a Large Plant

By J. B. NEALEY

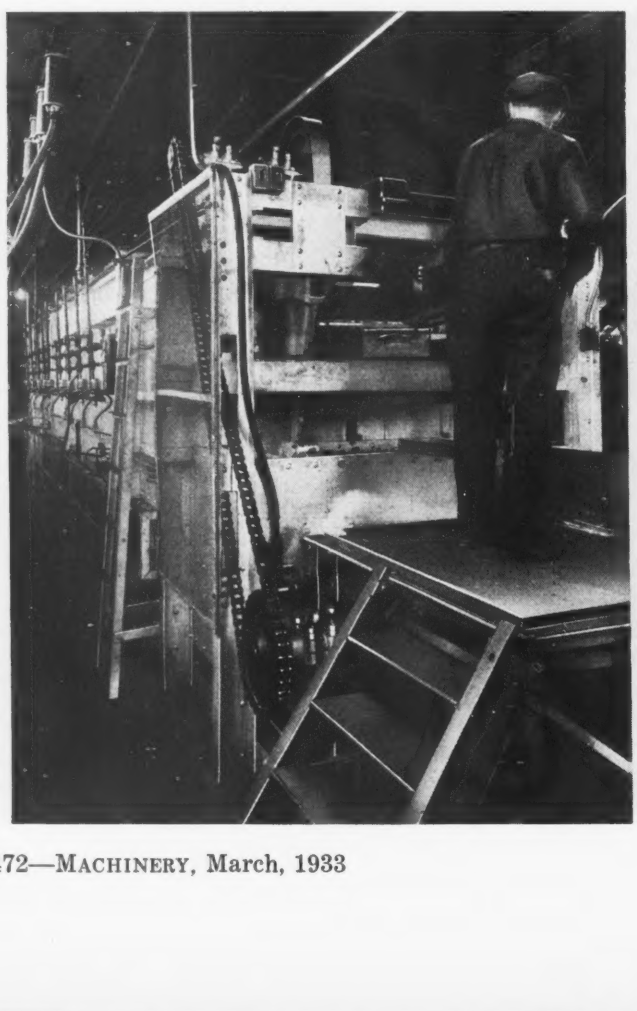
THE methods used in heat-treating the rear-axle drive shafts for Ford trucks at the plant of the Timken-Detroit Axle Co., Detroit, Mich., have been so planned that the heating, quenching, and drawing operations are carried on continuously by two operators. The equipment used is shown in the accompanying illustrations. It consists of a double-chambered furnace, Figs. 1 and 2, and a quenching tank, Fig. 3.

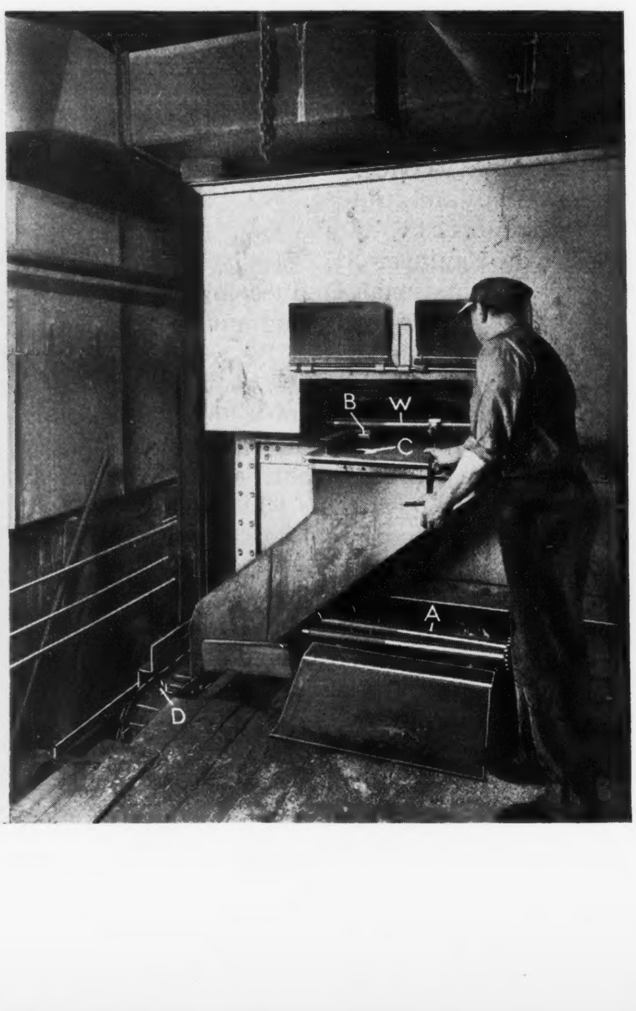
One operator standing on a platform, as shown in Fig. 1, transfers the shafts from the incoming conveyor to the charging end of the high-heat chamber; the other operator, Fig. 2, transfers the hot work *W* to the quenching tank, Fig. 3, and then places it on the conveyor of the low-heat drawing chamber at *A*, Fig. 2. The drawn shafts are delivered to an outgoing conveyor under the platform shown in Fig. 1. The double-chambered furnace, which heats the shafts for the two processes of hardening and drawing is so constructed that three different sections of the shaft are subjected to three different drawing temperatures at the same time. The furnace is built of brick, is heavily stayed, and is insulated. It is 30 feet long, 6 feet wide, and 10 feet high. The hearth of the high-heat chamber is provided with two long channels of special alloy in which ride special-alloy shoes *B*, Fig. 2. It is on these shoes that the shafts are carried through the high-heat chamber. A motor-driven cam-operated pusher pushes the shoes forward a short distance at each stroke.

The low-heat chamber has two looped chain conveyors to which work-carrying shoes are riveted. The chains are sprocket-driven by a motor located at the charging end of the high-heat chamber. The driving motor for the pusher used for the high-heat

Fig. 1. Charging End of High-heat Chamber and Discharge End of Double-chambered Furnace Used for Hardening and Drawing Drive Shafts

Fig. 2. Quenching End of Furnace, Showing the Operator Engaged in Transferring Shafts to Quenching Bath and Back to Drawing Chamber





chamber is also located at the charging end.

As the operator removes the hot shafts for quenching, the shoes *B*, Fig. 2, drop through holes *C* into chutes which deposit them on an apron conveyor at *D*. The conveyor returns the shoes to the opposite end of the furnace for re-use. It is operated by the same motor that drives the chain conveyor in the low-heat chamber. There are two caustic quenches in the steel quenching tanks which contain revolving fixtures in which the shafts are clamped to prevent warping. The operator watches thermometers submerged in the quenching tanks; and if one of the tanks becomes too hot, he starts a pump which forces the quenching medium through coils submerged in circulating water in another tank.

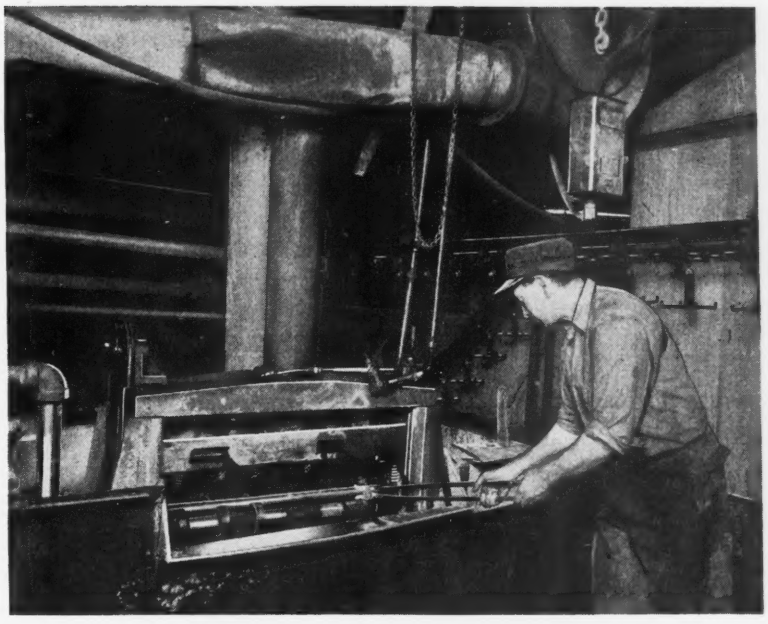


Fig. 3. Here the Operator is Shown Placing a Hot Shaft in the Quenching Machine

The high-heat chamber is heated by eighteen gas burners, nine on each side, all of which fire tangentially to the arch of the chamber roof. While almost enough heat is radiated into the lower or drawing chamber from the upper chamber, electric elements are located in the bottom of the lower chamber to control the temperature. This provides a sufficient heat differential between the two sides to give the shaft varying degrees of draw along its length. The third degree of draw is provided by means of a drilled gas-pipe burner, the heat from which plays upon the threaded end just before the end of the treatment.

The shafts heat-treated by the method described are made from Ford Triple-E steel, which is similar to S A E 1040 steel, except for the carbon content, which is 0.40 to 0.45 per cent, and the manganese content, which is from 0.70 to 0.90 per cent. The quenching heat is 1525 degrees F., and the time required for heating in the furnace is 1 1/2 hours. The tapered or threaded end of the shaft is drawn at 800 to 850 degrees F., the center at 650 to 700 degrees F., and the geared end at 400 to 450 degrees F., the work remaining in the low-heat chamber from three-quarters to one hour.

The burners in the high-heat chamber are of the inspirator type utilizing gas stepped up to 15 pounds pressure. They are provided with three automatic temperature controllers of the potentiometer type and two recording pyrometers, the controllers operating solenoid-equipped valves in the gas supply lines.

New Tendencies in Motor Drives

The tendency toward more complete motorization of machine tools is very marked. Where formerly one motor was used to drive all the different motions on a machine through a complicated system of gears, belts, or chains, several motors are now frequently used. J. W. Harper, of the General Electric Co., points out that this method has numerous advantages, some of them quite obvious, while others may not be recognized at first sight.

When a motor is used for a specific function of a machine tool, it is possible to eliminate cumbersome and often intricate mechanical drives. A case of such simplification is the planer type milling machine, with individual motors used on each head. This eliminates an elaborate system of shafts, bevel gears, and sliding mechanical connections.

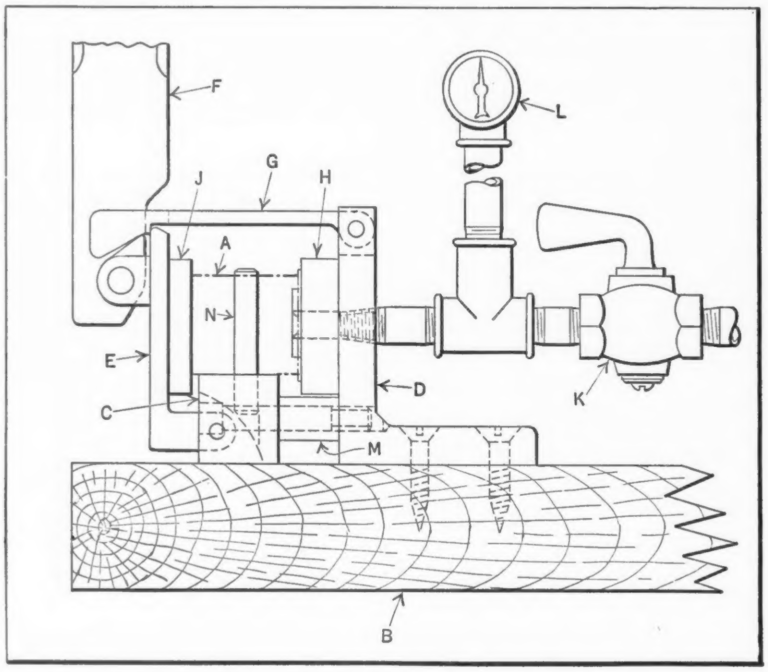
It is obvious that in order to carry out the simplification idea to advantage, the motor manufacturer must be prepared to furnish various modifications of standard motor mountings, so that the required results can be readily achieved. A machine is not improved in appearance if a heavy motor bracket must be supplied to support the motor. Hence, there is a decided trend toward flange- or end-mounted motors. Sometimes even such an arrangement may be objectionable, in which case motor parts can be made as integral parts of the machine. The woodworking industry has used, for many years, the shell or "tin-can" type of motor, the stator of which can be slipped inside a simple housing, the rotor being practically the machine spindle.

Compressed Air and Vacuum Test for Detecting Leaks in Drawn Shells

By HENRY W. BOEHLY

It is not uncommon for drawn shells to develop cracks. In the majority of cases, if the cracks are small, this does not render the shell useless. There are instances, however, where the shell must be air-tight. A fixture designed for testing the air-tightness of drawn shells is shown in the illustration, the shell being indicated at *A*.

The fixture is mounted on the bench top *B* and consists of the seat *C* upon which the shell is supported, the angle-bracket *D*, and the swinging clamp *E* pivoted in the seat *C*. This clamp is equipped with a latch arrangement formed by the levers *F* and *G*. Rubber pad *H* on the angle-plate seals the shell tightly, while another pad *J* on the clamp *E* prevents the shell from being distorted by the clamping action.



Quick-acting Fixture that Tests Drawn Shells for Leaks by Means of Compressed Air or a Vacuum

In operation, the shell is placed on the seat *C* against a centralizing pin *N*, as shown, and the lever *F* swung upward until the latch lever *G* engages the top of the clamp, in which position the shell is clamped tightly against the rubber pad on the angle-plate. Valve *K* is now opened and compressed air at 15 pounds pressure is allowed to enter the shell through the angle-plate and pad, after which the valve is closed. If there are any leaks in the shell, the air will leak out slowly, causing the pointer on the indicating gage *L* to move slowly toward zero. If the shell is sound, the pointer will remain stationary.

Lever *F* is swung downward to remove the tested shell. This movement causes the cam end of the lever to raise the latch lever *G*, allowing the clamp *E* with lever *F* to swing away from the shell.

Shells of various lengths can be tested on this fixture by using interchangeable bushings *M*. The same fixture can also be used for a vacuum test. For this test, no clamping means are required; hence, seat *C* and members *E*, *F*, and *G* may be removed. In that case, the pressure gage *L* must be replaced by a suitable vacuum gage. It has been found advisable to use two similar fixtures in both these tests. Thus, while the pressure on the gage is being noted, the operator can unload and load the other fixture.

* * *

Hard-Facing Increases Life of Surfaces Subjected to Severe Wear

The following examples indicative of the wear resistance of hard-faced surfaces, were given by W. A. Wissler in a paper read before a recent meeting of the International Acetylene Association. Shovel-bucket teeth, weighing 900 pounds each, which were hard-faced with Stellite at a cost of about $65 each, handled 400,000 cubic yards of limestone before further attention was necessary. The teeth were then reclaimed by being rebuilt and again hard-faced. The life of these teeth was seven times that of the steel teeth formerly used. The life of clam-shell bucket lips was increased about five times by applying 1/8 inch of hard-facing material.

Coke-pusher shoes, in one particular oven, were worn away at the rate of about 1 inch per month. The wear on these shoes was reduced to about 0.01 inch per month by hard-facing. The wear on the floor on which the shoes traveled was also reduced, because the hard-faced shoes did not pick up coke particles that would dig into the floor.

Shears of all types used for hot metal have also been hard-faced with good results. The application of hard-facing to one flying shear resulted in increasing the life of the shear seven times. Hot trimming dies for forging and forming dies for car ends were also hard-faced. The forming dies for car ends, for example, produced 13,000 pieces after hard-facing, as compared with 60 pieces for the all-steel die previously employed. Wire guides and punches for hot steel showed an increase in life of from four to six times.

* * *

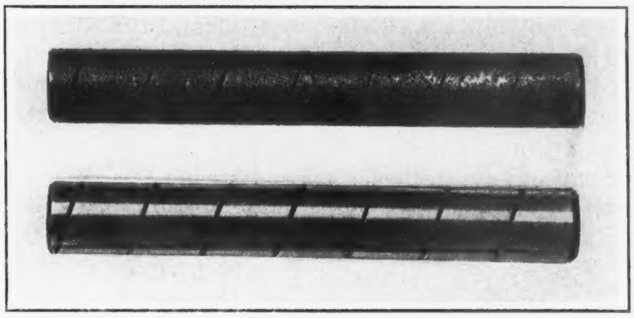
More than 5000 tons of steel are used annually in this country in the manufacture of miniature toy trains and tracks.

Preventing Corrosion After Machining

By V. W. WELLS, Engineer, E. F. Houghton & Co., Philadelphia, Pa.

ONE of the desirable qualities in a cutting oil is its ability to form a light film on the work which will protect the surface against corrosion for a reasonable period of time. This is particularly important if the parts are likely to remain in storage for some time before being assembled. Unfortunately, many cutting-oil manufacturers have given less attention to the rust-preventive qualities of oils than would be desirable. In fact, some cutting oils on the market today actually promote corrosion instead of preventing it.

In straight cutting oils, two ingredients are frequently present which cause the oil to corrode the metal surfaces in a short time. First, low-priced mineral cutting oil made from a mineral-oil stock which has been acid-treated, and as a result has a free-acid content. Second, lard oil or other animal oils that will develop free fatty acids on exposure to the atmosphere, unless the oil is properly treated during the process of manufacture. The development of free fatty acid is particularly rapid during hot weather, and frequently reaches such a point that it turns the oil rancid, as evidenced by a foul odor. Any free acid in a cutting oil will tend to etch a finely finished metal surface and eventually corrode the metal.



Roller-bearing Rollers after Thirty Days' Exposure to Atmosphere, Protected Only by the Grinding Solution Used in Finish-grinding Them on Centerless Grinders. For Grinding of the Upper Roller an Emulsifiable Cutting Oil was Used; for Grinding the Lower Roller, a Sulphonated Oil was Used

Comparison Between Self-Emulsifying Cutting Oils and Sulphonated Oils

The E. F. Houghton & Co., manufacturing both self-emulsifying cutting oils and sulphonated oils in great quantities, has made a thorough study of the action of the two oils and their capacity to prevent corrosion of metal parts after machining. It has been found that cutting oils which are mixed with water before being used must be very carefully made if they are to protect surfaces from corrosion for any length of time, due to the fact that they are so greatly diluted with water.

The ordinary emulsifiable cutting oils, which form a milky emulsion when mixed with water, are familiar to every machine shop foreman, but it may be of interest to mention here how these oils are made and how they may cause rusting of metal parts. They are usually composed of a low-priced mineral oil or an acidulated sludge which is high in free acid. This acid is generally neutralized to some extent before it is mixed with the proper proportion of soap to make it emulsifiable. Some solvent, such as alcohol, is usually added to this mixture to keep the soap and mineral oil in permanent solution. If this is not done, a large percentage of the soap will settle to the bottom of the barrel, and the mineral oil will contain an insufficient percentage of soap to emulsify it properly when mixed with water.

However, even though the soap does not separate in the barrel, it frequently does so after the cutting oil has been mixed with water. This is due to the fact that the alcohol or other solvent is readily soluble in water and immediately goes into complete solution in the water. The soap in the mixture is then gradually hydrolized by the water and develops free fatty acids.

When the soap hydrolizes, it is no longer capable of holding the mineral oil in emulsion, and the result is that the oil gradually separates and rises to the top of the solution. The free fatty acids developed have a corrosive action, of course, on metal surfaces.

It has also been found that these emulsions do not form a continuous oily film on the surface of the work after machining or grinding. When an emulsifiable cutting oil is diluted with water, the oil is broken up into very fine globules, mechanically dispersed in the water. When this solution dries on a metal surface, each globule of oil covers only a tiny spot of the metal, and there is a network between these spots that is unprotected. This is the chief reason why emulsifiable cutting oils fail to prevent work from rusting for any length of time.

A Comparison of the Rust Preventive Properties of Different Cutting Oils

A well-known roller-bearing manufacturer recently experienced trouble with bearing rollers rusting a few days after having been finished on a centerless grinding machine. In the accompanying illustration, the upper view shows one of these

rollers after thirty days' exposure to the atmosphere. The finely ground surface is almost entirely covered with rust.

In an effort to overcome this rusting, the company experimented with a grinding solution made from a sulphonated oil. This oil forms a permanent solution in water instead of a mechanical emulsion, so that each drop of water contains an equal quantity of the sulphonated oil. When this water-and-oil solution dries on the work, the entire surface is protected by a light oily coating. The rusting was entirely overcome with this type of grinding solution. The lower view in the illustration shows one of the rollers after thirty days' exposure. The surface was protected only by the light film deposited by the sulphonated-oil grinding compound.

Sulphonated cutting oils are particularly recommended when it is desired to prevent corrosion. Such oils are entirely neutralized after sulphonation, so that there is no component that will cause corrosion. When the water in the solution evaporates from the surface of the work, it leaves a *continuous* rust-preventive film, which, while not strong enough to be relied upon for permanent protection, can be depended upon to protect the surface for a few weeks, while the parts may be in process or storage, preceding assembly.

* * *

Present Screw Standards have Reduced the Number of Screws Carried in Stock

By E. CHAT. SHANKS

In attempting to reduce the inventory of screws kept in stock, it is often difficult to determine just where to begin. Bulletins on screw standardization published by the U. S. Government and the American Society of Mechanical Engineers suggest some new thoughts on this subject and present an opportunity for reduction.

According to certain bulletins of the American Society of Mechanical Engineers, the heights of cap-, fillister-, and set-screw heads have been reduced to approximately three-quarters of the screw diameter. For example, a 1/2-inch screw now has a head 3/8 inch high. This places the head height half way between the old so-called "full" and "low" heads. Consequently, it serves the purpose of both, especially if the tops are well rounded. This substitution in one plant has afforded a reduction of about 40 per cent in the number of types of screws carried in stock.

Machine screw sizes, such as 12-24, 16-20, and 20-16, are nearly duplicated by 1/4-, 5/16-, and 3/8-inch sizes. The advisability of retaining the machine screws is questionable, for their elimination would permit about a 50 per cent reduction in the number of small screw items. Replacement of the round and flat heads by the new fillister heads makes further reduction possible, the fillister-head type fulfilling the purpose admirably, particularly if there is a 1/16 inch radius at the upper edge of their heads.

Set-screws are commonly carried in cone-, cup-, round-, and dog-point styles. Observation proves that the cup and dog points serve nearly every purpose. Cup points are, therefore, used in place of cone points, and slightly rounded dog points instead of round points. Many plants still carry screwdriver-slot and patent-socket headless set-screws. By eliminating the former type, together with cone- and round-pointed screws, a 50 per cent reduction in set-screw items has resulted.

Screws of certain diameters, threads, and lengths are seldom used, and a careful check-up of usage in one instance revealed that many could be eliminated from the stock list. A 30 per cent reduction in items was accomplished in this way without any serious inconvenience to the engineering departments. A few blank screws in long lengths are kept in stock for items seldom used. They can be cut off and threaded as needed.

In conclusion, it can be said that by following the preceding suggestions, the number of screw stock items was reduced to only four types of heads—fillister- and hexagon-head cap-screws, and square- and socket-head set-screws. Two types of points only were used on set-screws. Near duplications were eliminated and items seldom employed were dropped. It was necessary, of course, to add to the quantities of the items retained, but a reduction of about 30 to 40 per cent of the quantity formerly carried resulted. The benefit thus derived—being able to manufacture or purchase the screws in larger quantities—was accompanied by a reduction in the number of taps, counterbores, and wrenches required.

Readers Who Are Changing Their Residence, Please Take Note!

The United States Post Office calls our attention to the fact that printed forms are available for sending out notice of changes of address. These forms (22-B) can be obtained from any letter carrier or at any post office without charge. They have space for the old as well as the new address. Readers who have moved or are planning to move can help to expedite the delivery of MACHINERY by asking their letter carrier or post office for form 22-B, filling it out, and forwarding it to us immediately.

A New Metal-Cutting Alloy with Possibilities of Wide Application

A new alloy known as 548 was announced by Dr. Zay W. Jeffries, president of Carboloy Co., Inc., Detroit, Mich., at a meeting of the American Society for Steel Treating recently held in Cleveland, Ohio. Laboratory tests and preliminary tests in production have shown that this alloy possesses qualities midway between those of high-speed steel and cemented carbide. These tests have indicated that the alloy will not only cut those materials that high-speed steel ordinarily machines, but also produces better results on the more easily machineable materials, such as soft steel and cast iron, as well as improved results on the harder steels.

Alloy 548 consists principally of a combination of iron, tungsten, and cobalt, but it varies from other alloys having these basic metals, in that it functions best when carbon-free or when possessing very little carbon. Like high-speed steels, the new alloy can be melted, cast, forged, or rolled, and then machined and heat-treated. Its moderate price permits it to be made into solid tools or cutters, although inserts may prove economical in many applications.

Carboloy Co., Inc., states that the announcement made by Dr. Jeffries was intended as a general statement of the present status of the development and application from the standpoint of metallurgical interest rather than as a formal commercial release. Although the alloy gives every indication of being satisfactory in the field defined, the manufacturer plans to follow a conservative policy in releasing the material by selecting representative applications in various industries and closely following those applications during the initial period of commercial development.

* * *

Foreign Trade Convention to be Held in Pittsburgh

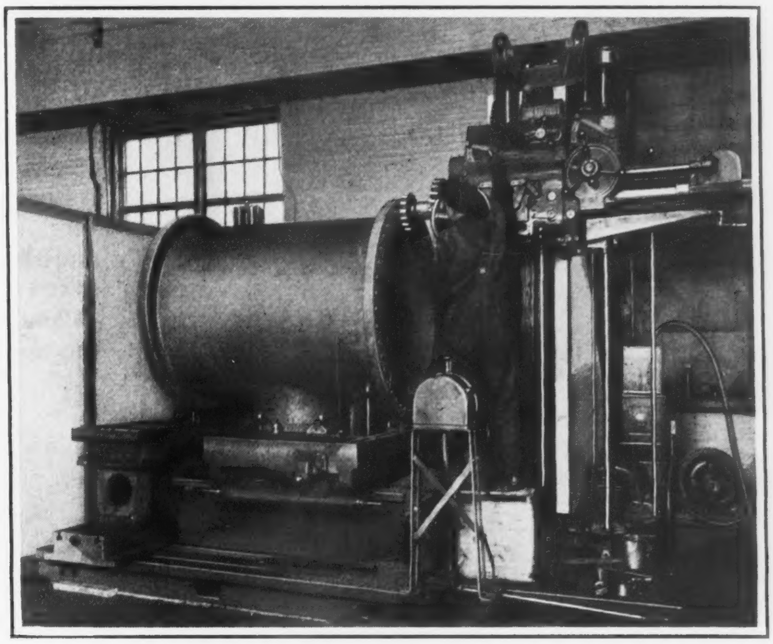
The Twentieth National Foreign Trade Convention will be held in Pittsburgh, Pa., April 26 to 28, with headquarters at the William Penn Hotel. At this meeting, papers will be presented on a great variety of foreign trade problems, including foreign trade banking, government insurance for export trade, international barter, current credit and collection practice, and the world trade outlook.

* * *

In 1932, there were 99,000 motor buses in use, 45,000 of which were revenue carriers and 52,000 vehicles for transporting school children.

New Methods Reduce Facing and Slotting Time on Large Castings

"Grinder pocket" castings for paper mill machinery present a rather unusual machining problem. The facing operations and the cutting of the required slots on all four sides of the particular grinder pocket shown in the accompanying illustration previously required twelve hours and forty-two minutes. With the set-up illustrated, the Green Bay Barker Machine & Tool Works, Green Bay, Wis., have reduced the time for these machining operations to seven hours and thirty-two minutes, using an Ohio Machine Tool Co.'s horizontal boring, drilling, and milling machine.



Facing a Large Casting on an Ohio Horizontal Boring, Drilling, and Milling Machine

* * *

Recording Designs Before Changing

By W. S. BROWN

Frequently when a series of machines has been built from a set of drawings, the designs are revised before building the next series. In such cases, it is usually essential to keep clear records of the original designs. For this purpose, the method here described often proves very satisfactory. It applies when the major part of a drawing is unchanged.

The first step is to make a Vandyke cloth print from the tracing to be changed. The Vandyke print then becomes the equivalent of the original, and can be used to produce blue line prints on a white background if desired. The changes can now be made on the original tracing, and by giving it a new drawing number the parts made from it are distinguished from those of the original design.

Milling of Large Work Facilitated by Front and Rear Controls

The advantages of a modern milling machine with dual controls are exemplified by the job here illustrated. The large casting, extending high above the milling machine table, requires certain milling, drilling, and boring operations to be performed in one setting. Some of these operations, like the drilling operation shown in the illustration, must be performed on surfaces that cannot be seen from the operating position of the older type machines having only one set of control levers. In the Cincinnati machine illustrated, the operator has a clear, unobstructed view of the tool from the rear operating position. According to an accurate time study, the duplicate controls on this machine save the operator twenty-six trips around the end of the table that would be necessary with a machine having only one set of controls. This machine reduced the handling time on the job illustrated 27 per cent.

Using Rear Controls of Cincinnati Milling Machine for Drilling Operation on Surface that is Hidden from the Front Operating Position, Reducing Handling Time by 27 Per Cent

* * *

At the end of last year, 51 per cent of the tonnage of the new ships being built throughout the world were driven by Diesel engines.

Chicago Sectional Meeting of Mechanical Engineers

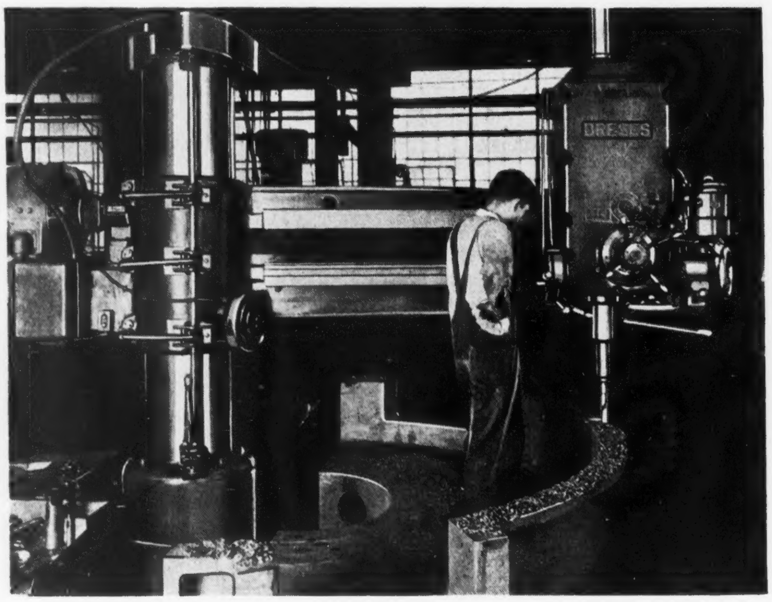
The Chicago Section of the American Society of Mechanical Engineers will hold its annual machine shop practice meeting on March 30 in the auditorium of the Engineering Bldg., Chicago, Ill. There will be both afternoon and evening sessions. The papers to be presented will show the trend and interesting developments in machine tools, new cutting metals, and the latest design of boring-bars and multiple cutting tools. The members of the following societies have been invited to attend this meeting: Western Society of Engineers, Chicago Engineers Club, Superintendents' and Foremen's Association, American Machinery and Tools Institute, Purchasing Agents' Association of Chicago, and the Illinois Manufacturers' Association. C. B. Cole, president of the Tool Equipment Sales Co., 4625 Fulton St., Chicago, Ill., will be chairman of the meeting.

* * *

Drilling Time on Fan Housing Cut in Half

Twenty-seven 1 3/8-inch holes are drilled through the two-inch flange of the 6000-pound cast-iron fan housing shown in the accompanying illustration, and spot-faced to a diameter of 2 1/2 inches on the under side, in one hour and ten minutes, at the Kling Bros. Engineering Works, Chicago, Ill. Previous to the installation of the Dreses radial machine illustrated, this work consumed two hours and fifty minutes, or more than twice the time now required.

Drilling and Spot-facing Twenty-seven Holes, 1 3/8 Inches in Diameter, in One Hour and Ten Minutes on a Dreses Radial Drill



Cutting Risers from Chrome-Nickel Steel Castings*

How the Oxy-Acetylene Cutting Torch is Solving a Difficult Metal-Cutting Problem

By R. B. AITCHISON
Oxweld Acetylene Co., New York

WHEN foundries first began to produce chrome-nickel steel castings, it was found that the customary oxy-acetylene cutting procedure used to remove risers from ordinary steel castings would not work with the oxidation-resistant chrome-nickel steels. Thus it was necessary to try other methods; none of the methods tried, however, were comparable in speed and economy with the oxy-acetylene method used in cutting plain steel risers. Representatives of the oxy-acetylene industry then decided to investigate the possibilities of adapting the oxy-acetylene cutting process to chrome-nickel steel, with the result that a skillful operator can now sever a 6- by 6-inch chrome-nickel steel riser in from 3 to 3 1/2 minutes. The procedure followed in handling this kind of work is outlined in the following paragraphs.

The casting, with the riser to be removed, is properly located on the cleaning floor and the blowpipe made ready. As considerable heat is required, it is recommended that the cutting-torch nozzle or tip be one size larger than that used in cutting castings of plain steel. The oxygen hose should be about 3/8 inch in diameter, in order to secure ample volume. It is preferable that the tip have six preheating jets rather than the usual four or less. The oxygen cutting pressure should be about 15 to 20 per cent more than that used in cutting castings of ordinary steel. The procedure described here applies to the injector-type blowpipe in which the oxygen aspirates sufficient acetylene to maintain a neutral preheating flame.

The blowpipe is so adjusted that the preheating flame will never be oxidizing when the cutting jet is wide open. A mere feather of acetylene in the preheating flame is not objectionable and may be of help to the beginner, but a distinct and heavily carbonizing flame is detrimental to the cutting action in that the preheating temperature is lower.

The cut is started horizontally across the top surface of the riser and progresses downward in a vertical plane from the upper to the lower surface. During the cutting, the blowpipe is moved up and down. In starting the cut, the operator first preheats the top of the riser across the line of cut. This is necessary in order to establish a straight kerf and prevent forming a pocket that will stop the cut. When the line of cut has been preheated to a dull red, the operator concentrates the preheating flame at the point where he will start cutting. The metal will become white hot very quickly at this point and start to melt. The blowpipe tip is then directed in a horizontal plane across the top of the metal.

Next, the blowpipe is moved so that the inner cone of the preheating flame will be, perhaps, 3/16 inch away from the face of the riser. As this is done, the cutting oxygen is turned on. If the preheating has been sufficient, the cut will start and the operator will be able to look into the kerf and watch the cutting process. The slag will be much more incandescent than is the case with plain steel and will crackle and spark violently. The operator will, with gentle but speedy up and down motions, cause the torch to commence to bite or cut through the riser. The resulting sound will resemble that occasioned by the rapid sawing of hard wood. The up and down motions must be kept in the vertical plane and not allowed to swing from side to side; otherwise too much time and material will be consumed.

It will be noticed that the cut is not always sustained at the point directly in front of the blowpipe tip. This is probably due to the fact that the cutting oxygen is still cool, even after passing through the preheating flame. For this reason the inner cone should be kept a short distance from the face of the riser. The operator should not stop his work because of this refractory spot, as it will become oxidized and be carried off as the work continues, there being a tendency for the operator to unconsciously vary the distance between the blowpipe tip and the face of the casting in order to achieve this result. If the operator stops during a cut and allows the metal to cool off to a low heat, it will be difficult to start the cutting action quickly.

The time required for cutting chrome-nickel steel risers does not vary greatly from that required for cutting risers from ordinary steel castings, once the operator has learned the correct procedure. The kerf is about one-third wider in chrome-nickel steel than in carbon steel of the same diameter. The cut surface will not be so smooth as that of plain carbon steel, because of the hand manipulation or movements required.

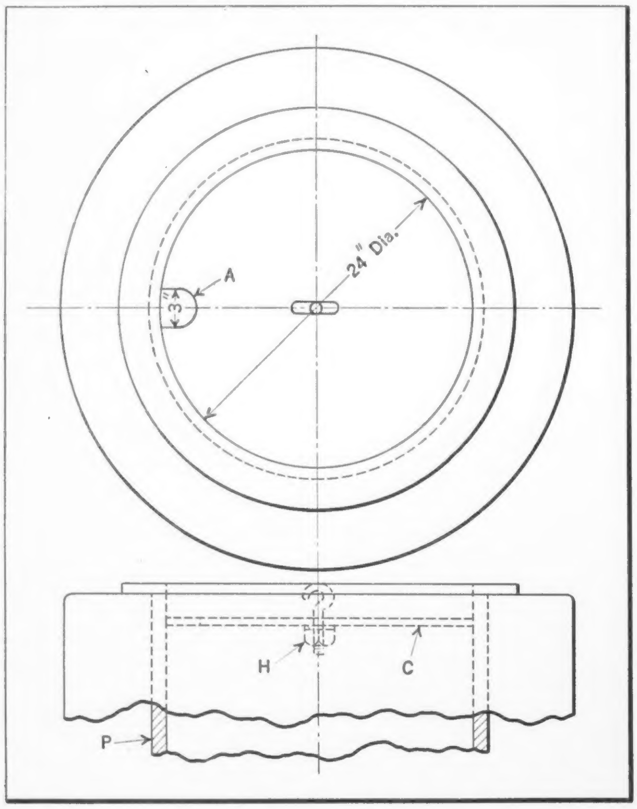
Very small risers, that is, risers from 1 to 1 1/2 inches in size, can be nicked on each side to a depth of about 25 per cent of the total thickness, and removed by flogging while hot. If the flogging is done directly after nicking, there will be much less danger of damage to the casting. The nick on each side of the riser tends to insure a clean break at the desired point. Experience has shown that the methods described here work satisfactorily on chrome-nickel steel casting materials, particularly the variety known as "18 and 8."

*Abstract of a paper presented before the International Acetylene Association.

Saving Babbitt by Covering Melting Pot

By JAMES J. BAULE

The loss of babbitt metal through oxidation in a number of 24-inch round cast-iron melting pots has been greatly reduced in a certain plant by providing a simple and effective means of covering the



Section of Babbitt Melting Pot Provided with Asbestos Cover

molten surfaces. As the metal in these pots is kept in a molten state during some twelve hours each working day, and at a temperature of about 250 degrees F. above the melting point, the rate at which the molten metal oxidizes is very rapid.

The first method suggested for preventing this excessive oxidation was to cover the molten metal with charcoal. The oxidizing or burning charcoal partially prevented air from coming in contact with the free surfaces of the molten babbitt and thus reduced the rate of oxidation. While this method worked to some extent, the desired savings were not realized, because of the cost of the charcoal and because the ashes in the babbitt drosses made them non-uniform and thus lowered their market value.

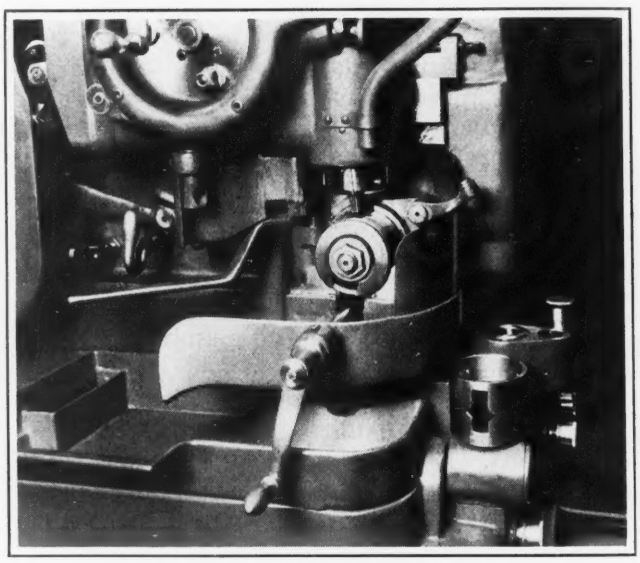
Later, the successful method here described was adopted. This method consists of providing an asbestos board cover *C*, as shown in the accompanying illustration. The diameter of this cover is 1/8 inch less than the inside diameter of the pot *P*. The cover, which floats on the surface of the molten metal, has an opening *A* just large enough to admit the dipping ladle, and is equipped with a hook *H* in the center to facilitate removal when it becomes necessary to skim the pot. The cover is of sufficient thickness to prevent warpage and to insure contact with the entire surface of the metal at all times.

Tests were made on three pots simultaneously to determine the saving realized by protecting the surfaces against oxidation. These tests covered a period of fifty-four hours. One of the pots was not covered at all, another had a layer of charcoal on it, and the third had a floating asbestos board cover. The oxide was kept in separate containers and weighed at the end of the run. The results were more than pleasing, the oxides from the three pots weighing 232, 198 and 78 pounds, respectively. At a cost difference of ten cents a pound between the babbitt metal and its oxides, it is readily seen that a substantial annual saving has been obtained.

* * *

Slotting Collars for a Synchro-Mesh Transmission on a Gear Shaper

The accompanying illustration shows a gear shaper set up for performing a slotting operation on a collar for a synchro-mesh transmission. The

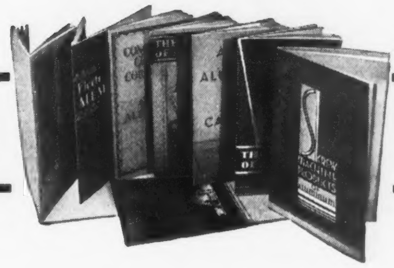


Gear Shaper Set-up for Performing Slotting Operation on Collars

operation consists of finishing V-shaped locking slots. One V-shaped slot is cut on one side of each of the three rectangular slots, after which the collar is reversed on the arbor and the V-shaped slots are cut on the opposite side. The fixture is indexed by hand.

* * *

"Never" is the keynote of a limited imagination. "It can never be done," closes the door of the unprogressive mind.

NEW TRADE  LITERATURE

Recent Publications on Machine Shop Equipment, Unit Parts, and Materials. Copies Can be Obtained by Writing Directly to the Manufacturer.

ELECTRIC EQUIPMENT. General Electric Co., Schenectady, N. Y. Circular GEA-1480B, descriptive of the new G-E photo-electric recorder by means of which a graphic record can be made of such quantities as previously could only be recorded in the laboratory. This instrument measures electric current, temperatures, thickness of sheet metal, paper, etc., noise intensity, illumination intensity, and vibration intensity. Bulletin GEA-1014A, descriptive of circuit-breakers for 600-volt railway service. Bulletin GEA-1195A, illustrating and describing G-E synchronous motors for driving metal-rolling mills. Bulletin GEA-1538, on G-E Type K totally enclosed squirrel-cage motors.

DIE SETS. E. A. Baumbach Mfg. Co., 1810 S. Kilbourn Ave., Chicago, Ill. Die Set Guide and Catalogue No. 5, covering the complete line of die sets made by this company. The catalogue gives price and dimension tables, as well as illustrations and a general description of the different designs. Data are also included on die-shoes, punch-holders, bars, bench legs and plates, bolster plates, bushings, clamps, dowel-pins, etc.

ZINC DIE-CASTINGS. New Jersey Zinc Sales Co., Inc., 160 Front St., New York City, is issuing a series of folders, entitled "The New Jersey Zinc Alloy Pot," devoted to new developments in zinc die-castings. New uses, engineering features, economical features, physical properties, plating, lacquering, enameling, etc., will be among the subjects treated.

BORE-MATIC PRECISION FINISHING MACHINES. Heald Machine Co., Worcester, Mass. Bulletin No. 4549-8010, illustrating and describing the Heald No. 47 Bore-Matic, an automatic precision boring machine. The halftones in this bulletin are unusually striking, having been made from photographs taken to produce pronounced contrasts in light effects.

SPECTROSCOPES. Adam Hilger, Ltd., 98 Kings Road, Camden Road, London N.W. 1, England. Pamphlet entitled "Increasing the Quantitative Accuracy of a Spectrometer," descriptive of an eye-piece attachment for a spectroscope for use in analyzing metals, alloys, powders, liquids, etc.

HYDRAULIC PUMPS. Worthington Pump & Machinery Corporation, Worthington Ave. at Warren St., Harrison, N. J. Bulletin D-111-S1A, descriptive of horizontal, simplex, double-plunger, forged-cylinder hydraulic pumps with a maximum liquid end pressure of 10,000 pounds.

WELDED-STEEL MACHINERY AND EQUIPMENT. Austin Co., 16112 Euclid Ave., Cleveland, Ohio. Circular describing in detail the service offered by the welding division of the company. It also points out the advantages that can be obtained through welded-steel construction.

BELTING. L. H. Gilmer Co., Tacony, Philadelphia, Pa., is distributing every other month a publication known as *The Gilmer Arc of Contact.* This publication will deal with problems in power transmission and with new developments in belting and various applications.

HYDRAULIC FEEDS AND CONTROLS. Vickers, Inc., 7752 Dubois St., Detroit, Mich. Circular illustrating and describing the Vickers control panel for hydraulic circuits; Vickers combination pump and valve units; and Vickers Series 400 balanced valves for hydraulic circuits.

TOOL RECLAIMING SERVICE. Paramount Tool Co., 1392 E. 43rd St., Cleveland, Ohio. Circular descriptive of the Paramount hard-chrome system for reclaiming and putting back into service pneumatic tools through the application of hard chromium to the worn parts.

RUBBER BEARINGS. B. F. Goodrich Rubber Co., Akron, Ohio. Catalogue entitled "Cutless Rubber Guide Bearings as Applied to Hydraulic Turbines," containing information that should be of value to anyone making a study of bearing problems in any field.

ELECTRIC EQUIPMENT. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Leaflet 20563, describing the Westinghouse Photo-Troller, an electronic-tube controller actuated by a photo-tube, which is adapted to a wide variety of applications.

GRINDING MACHINES. Thompson Grinder Co., 1534 W. Main St., Springfield, Ohio. Bulletin illustrating and describing in detail Thompson hydraulic surface grinding machines, which are made in three sizes. Complete specifications are given for each size.

STAMPED AND DRAWN METAL PRODUCTS. Edwin B. Stimpson Co., 70 Franklin Ave., Brooklyn, N. Y. Circular showing examples of 193 different metal products, including rivets, fasteners, eyelets, arrows, etc., as well as eyeleting machines.

MONEL METAL. International Nickel Co., Inc., 67 Wall St., New York City. Bulletin T-5, entitled "The Engineering Properties of Monel Metal." This bulletin is one of a series containing technical information on Monel metal and other nickel alloys.

ELECTRIC MOTORS. Ideal Electric & Mfg. Co., Mansfield, Ohio. Bulletin 540, containing a complete description of the Ideal "Self-Syn" motors. Details are given relating to the design, construction, and characteristics of these motors.

WELDING MACHINES. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Leaflets 20555 and 20556, describing the new Westinghouse 300- and 400-ampere gasoline-engine-driven FlexArc welders.

POWERED GEARS. Foote Bros. Gear & Machine Co., 5301 S. Western Blvd., Chicago, Ill. Circular announcing a new line of IXL helical-gear-type powered gears, which are made in single, double, and triple reduction ratios.

ARC-LAMP GLOBES. C. F. Pease Co., 813 N. Franklin St., Chicago, Ill. Circular descriptive of Thermex arc-lamp globes, which are designed to resist high and rapid changes in temperatures.

TRANSMISSION BELT. B. F. Goodrich Rubber Co., Akron, Ohio. Eight-page supplement to the company's mechanical goods catalogue, dealing with Highflex rubber transmission belt.

PRESSES. Rockford Iron Works, Rockford, Ill. Circular illustrating and describing the Rockford Simplex drawing device for double-action work on single-action presses.

PIPING. Republic Steel Corporation, Youngstown, Ohio. Folder illustrating, describing, and giving dimensions of electrically welded drive pipe and casing.

MAGNESIUM ALLOYS. Dow Chemical Co., Midland, Mich. Circular illustrating the use of Dowmetal in trucks where light weight and speed are desirable.

LEVER PUNCHES. W. A. Whitney Mfg. Co., 636 Race St., Rockford, Ill. Circular illustrating and describing bench punches for channel and angle iron.

Aluminum-Alloy Vises for Airship

When the Navy's newest airship, the *Macon*, takes to the air, she will carry as part of her repair equipment, three light aluminum-alloy machinists' vises, equivalent to steel vises in efficiency, but weighing only a fraction as much.

The vises are made by the Columbian Vise & Mfg. Co., Cleveland, Ohio. They are identical in appearance to regular malleable-iron vises. However, by using aluminum castings for the front and back jaws and for the swivel-base, the weight has been reduced to 12 pounds, as contrasted with approximately 30 pounds for an ordinary vise. Steel is used for the jaw faces, screw, and handle; malleable iron for the nut and swivel lock-bolt. A steel washer separates the halves of the swivel-base to prevent excessive wear, and a steel thrust washer is used on the main screw for the same purpose. All aluminum castings were subjected to an X-ray inspection before assembly.

Baling Press for Scrapping Automobiles

The "jaws" of an enormous hydraulic baling press installed in the plant of the Ford Motor Co., Dearborn, Mich., are capable of closing on a complete automobile or truck and crushing it to a bale of metal of open-hearth charging-box size, at the rate of one car a minute.

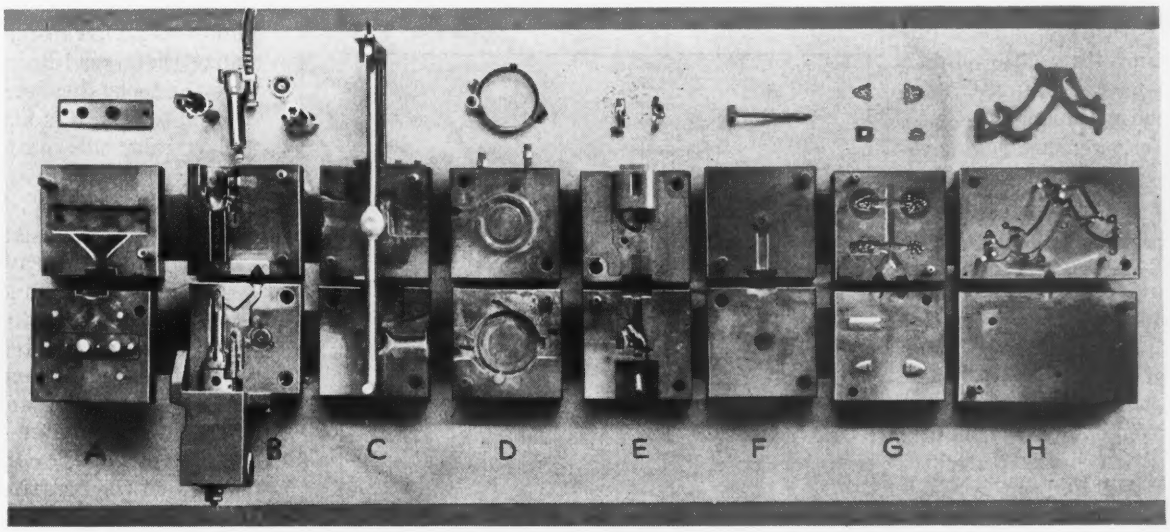
This is probably the largest baling press in the world. It is 40 feet long, 30 feet high, 10 feet wide, and weighs 500,000 pounds. The charging box is 17 feet long, 7 feet high, and 6 feet wide. An eight-ton hydraulically operated steel gate is dropped down to close the opening through which the car enters the charging box. A horizontal traveling ram exerting 360 tons pressure advances against the front of the car and crushes it from a 17-foot length to 30 inches. As the horizontal ram holds the partially compressed car firmly, a vertical ram weighing 17 tons and exerting a pressure of 1500 tons, descends to effect the final compression.

Equipment for Molding Plastic Materials

A review of the methods used in molding synthetic plastic materials, such as Bakelite and Durez, will be contained in an article to be published in April MACHINERY. Among the subjects to be dealt with are methods used for heating and operating press platens, the operation of hand molds, the use of loading trays for multiple molds, the use of compressed molding powder to reduce molding time, the operation of semi-automatic and automatic molds, shrinkage allowances for molded parts, and the selection and treatment of materials used for plastic molds. Other articles pertaining to the molding of plastic materials will follow in coming numbers.

Shop Equipment News

Machine Tools, Unit Mechanisms, Machine Parts and Material-Handling Appliances Recently Placed on the Market



Kipp Die-Casting Machines for Small Parts

A series of die-casting machines in the low-priced class has been developed by the Madison-Kipp Corporation, Madison, Wis., for the economical production of comparatively small parts. These machines are intended not only for the job shop and small manufacturer, but also for the large manufacturer who has diversified lines in which there are both small and large quantity runs.

The new series comprises the No. 11 machine (described in September, 1932, MACHINERY, page 64) which is intended for producing parts from aluminum, Duralumin, Nicralumin, magnesium, and similar alloys; the No. 15 machine, designed for the production of zinc, lead, and tin alloy parts; and the No. 26 machine (illustrated in Fig. 1) which is a combination of the other two styles.

Fig. 1. Kipp-Caster for Small Parts

The No. 11 is an under-shot machine, that is, the metal enters the dies from the bottom at the parting line. It has a metal well for hand-loading and a hand-operated plunger mechanism for introducing the metal into the die cavity under pressure. The No. 15 is a side-shot machine, the metal entering at the side of split-gate dies. This model is equipped with an electrically heated metal pot and a plunger-loaded metal pressure gooseneck. Semi-auto-

matic operation is a feature of this model. As the dies are locked shut, the metal pot and gooseneck are automatically rocked into the casting position. The geared plunger lever is unlatched at this point, so that it can be pulled down to force metal into the die cavity only at the proper time in the machine cycle. Core pulleys are operated either automatically or by hand. The ejection of the casting is automatic.

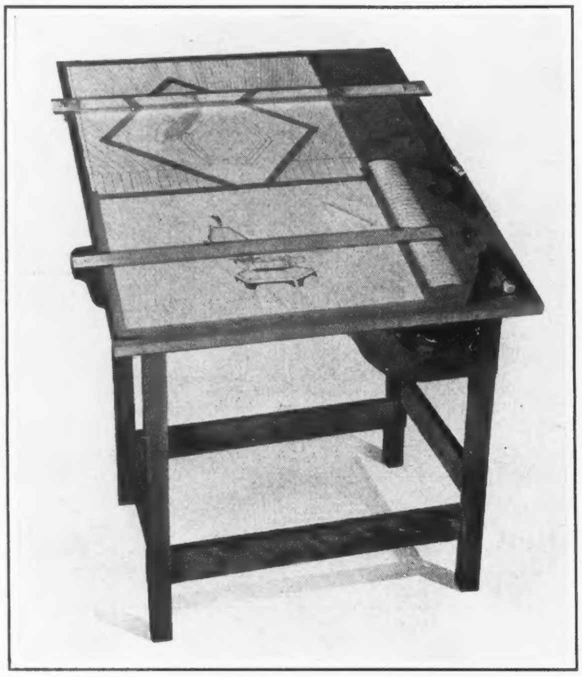
Operating speeds of from three to eight shots per minute, depending upon the type of casting, are regularly maintained. In operating the No. 15 machine, one movement of the operator's right hand on spoked handwheel *A* closes the dies at *D* and rocks the metal pot *C* into the casting position; one movement of the right foot on pedal *B* locks the dies and the gooseneck; one movement of the left hand on lever *E* pumps the plunger of the metal pot; and a final movement of the left foot on pedal *F* unlocks and opens the dies. Trip *H* prevents handle *E* from being operated until the dies are locked in the casting position. The gooseneck nozzle is indicated at *J*.

In the case of the No. 11 machine, the metal pot *C* and plunger mechanism on the side of the machine are omitted. Handle *G* operates the plunger mechanism.

Typical dies for the new machines are shown in the heading illustration. Die *A* produces a flat plate measuring 1 7/16 by 5 1/8 by 3/16 inch, which is cast from aluminum in the No. 11 machine. There are no moving cores, the hole cores being stationary in the movable half of the die. The cast plate is automatically ejected from the cores when the die is opened. Die *B* is used in the No. 15 machine for producing a body and back plate from zinc alloy for a high-speed air turbine grinder. The body casting requires a core pull of 4 inches. The inside of this casting is held to close tolerances, and the wall section is only 0.0625 inch thick, the total casting weighing only 3 1/2 ounces. Die *C* illustrates how a Duralumin boss can be die-cast around a rod of the same material.

Die *D* is for casting a ring body containing a wick oil-well and forked driving bosses. The metal is a zinc alloy. A ball-ended steel part is used as an insert in the casting made in die *E*. A slot is cast in the part, the core for which is automatically lowered into and raised out of the casting position by means of an angle-pin, when the die is opened and closed. By means of die *F* a magnesium turbine-bladed rotor is die-cast on an alloy steel spindle.

Novelty jewelry is die-cast from a special brass alloy by means of die *G*. This example is a master die in which cavity inserts can be changed for casting different parts. Die *H* is for making a lead alloy casting. It is a variation from the standard die size of 6 by 6 by 3 inches.



Equipment that Facilitates the Making of Perspective Drawings

Calibron Perspective Machine

A machine that simplifies the making of perspective drawings so that any draftsman can produce them accurately and rapidly has been placed on the market by Calibron Products, Inc., 51 Lakeside Ave., West Orange, N. J. It affords a means of making perspective drawings of proposed new products, so that the manufacturer can visualize them readily before the tools, dies, etc., are made. There is also a particular advantage in making patent drawings.

The machine consists of a perspective drawing mechanism mounted on a special drafting table, as illustrated. The mechanical parts visible—a cylinder and sliding straightedge—are mechanically connected. On the drafting board there is a sheet of specially ruled paper, the upper portion of which has a series of converging straight lines which become vertical lines on the lower portion. Attached to the cylinder there is another sheet of ruled paper with lines representing perspective heights.

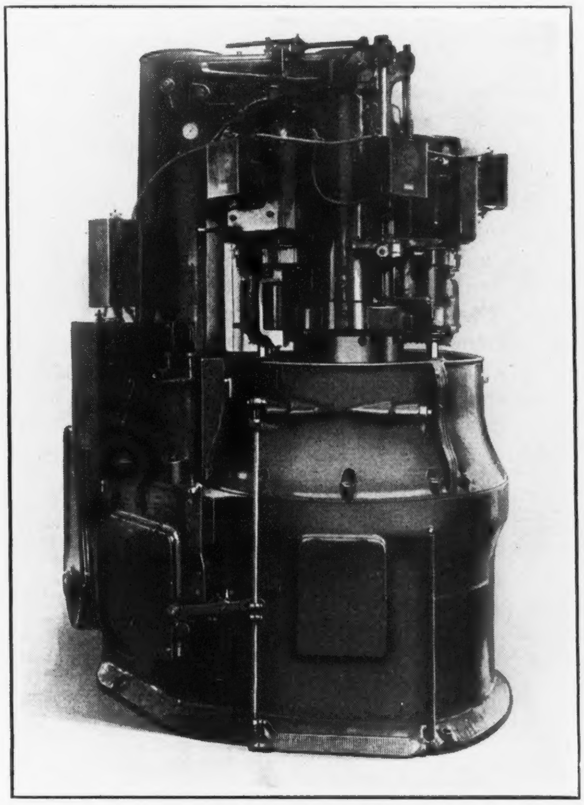
Only three simple operations are necessary to obtain the perspective position of any point as follows: (1) Set the straightedge on the desired point in the plan view by turning a crank which operates the cylinder and the sliding straightedge; (2) project horizontally the corresponding perspective height of this point from the cylinder chart by using a T-square; and (3) follow the lines on the specially ruled paper from the point on the plan view to the T-square to find the desired perspective point. By locating the principal points in this manner and connecting them, a true perspective is obtained. Problems with unusual angles can be solved.

Baird Automatic Multiple-Spindle Grinder

An automatic internal grinding machine with a multiple number of spindles has been developed by the Baird Machine Co., Bridgeport, Conn. The particular machine illustrated has eight spindles. Six of the stations are used for grinding and the other two can be used for reloading, or one can be used for reloading and the other for polishing or gaging. The machine can be arranged for double indexing, so that a piece of work can first be ground from one end and then ground from the other end in a second pass around the machine.

The grinding wheels do not need to be of the same size or dressed alike. Each wheel is automatically dressed and sized according to its need, independently of the other wheels. The speed and feed of each wheel are likewise independent, and a wheel can be replaced at any point in the machine cycle without disturbing the other wheels. Roughing and finishing wheels can be used.

The machine occupies a floor space of about 74 by 61 inches and is approximately 9 feet high. It weighs about 27,000 pounds. Work up to 11 inches in diameter can be accommodated on this machine.

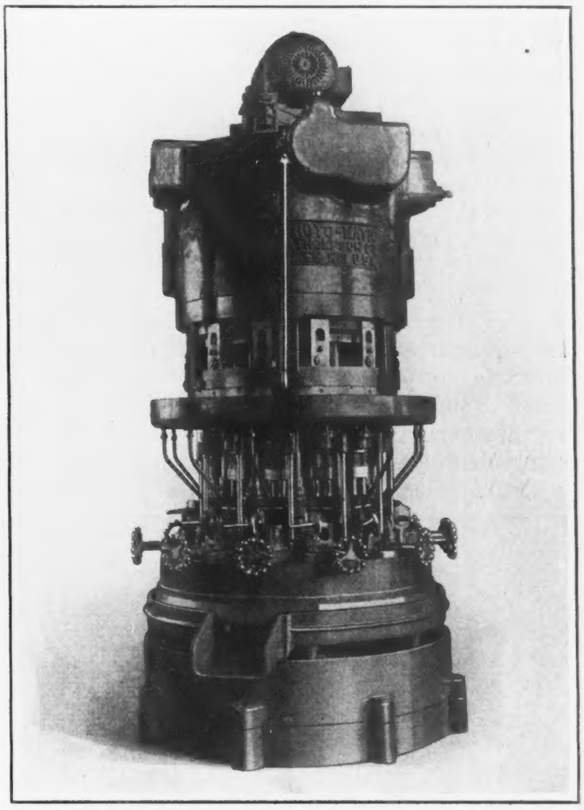


Baird Automatic Multiple-spindle Grinding Machine for Internal Grinding Operations

Rotomatic with Drilling and Milling Heads

Twelve two-spindle drill heads and twelve spindles for straddle-mills are provided on a vertical continuous-type drilling machine recently built by the Davis & Thompson Co., 6619 W. Mitchell St., Milwaukee, Wis. This machine is equipped for operations on automobile steering arms.

The work-pieces are held in twelve fixtures, which are oscillated by a stationary cam beneath the table. As the machine turns around, each fixture carries the boss on the end of the steering arm beneath the straddle-milling cutters. When the milling operation has been completed, the piece is carried under a drill for drilling a hole, and it is finally carried under the second drill-head spindle for taper-reaming the hole. The production is approximately six hundred pieces an hour. This machine is so designed that it can be used for a wide range of work.



Continuous Type of Machine for Straddle-milling, Drilling, and Taper-reaming Steering Arms

Crescent Stainless Tape-Rule

Both the blade and the case of a Crescent No. S-696 rule, just placed on the market by the Lufkin Rule Co., Saginaw, Mich., are made of stainless steel. Except for this feature, the rule is the same as the one described in July, 1931, MACHINERY, page

888. The 6-foot rule blade is graduated in sixteenths of an inch and inches, for general use. However, a rule is available for engineers that is graduated along the upper edge in feet and tenths and hundredths of a foot, while the lower edge is graduated in feet, inches, and sixteenths of an inch.

Bullard Twin-Six Mult-Au-Matic

A six-station Mult-Au-Matic with two spindles at each station, making twelve spindles in all, is the latest development of the Bullard Co., Bridgeport, Conn. With every single indexing of the machine, two new spindles are presented at each column face, where duplicate tooling is provided to perform identical operations on work in each of the twin chucks. This arrangement doubles the output of the machine with only a slightly greater investment.

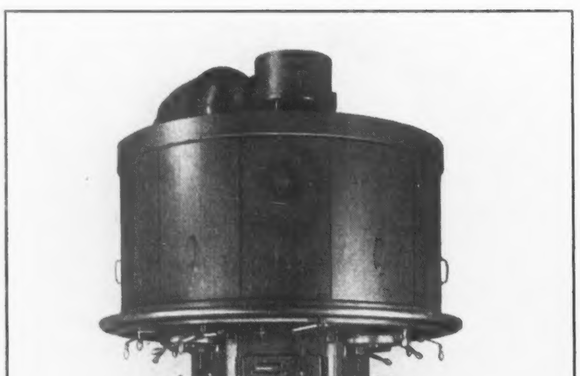
This Type F Mult-Au-Matic can also be double-indexed when the number of operations required in any one chucking will permit complete machining at four stations. Boring, turning, facing, drilling, and reaming can be performed on work up to 7 inches in diameter. The machine can be provided with either high or low speed ranges. An automatic chucking mechanism is adaptable to such special chucks and fixtures as the work may require.

Various standard tool-heads can be supplied, including a plain vertical tool-head, a plain compound tool-head, and a universal tool-head. For work requiring drilling, duplex live-spindle drill heads can be applied. This Mult-Au-Matic has a base machine weight of 18,000 pounds.

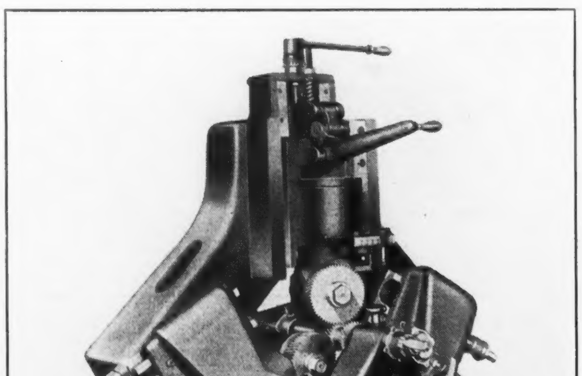
Michigan Gear-Lapping Machine

A gear-lapping machine has recently been designed by the Michigan Tool Co., 7171 Six Mile Road, E., Detroit, Mich., which is equipped with three laps, spaced about equally around the work. Each of the laps may be set with its axis at an angle to the axis of the work, thereby producing a sliding action between the lap and the gear teeth. The upper lap is raised and lowered by means of a handle to load and unload the machine.

A hydraulic brake on each lap-spindle may be set to almost any predetermined pressure for speeding up lapping operations. The headstock and tailstock for supporting the work, either between centers or stub arbors, are mounted on a table which is oscillated at various speeds. It is claimed that this arrangement insures even lapping throughout the full length of the gear teeth. The tailstock spindle can be moved 8 inches for reloading.



Mult-Au-Matic with Twin Spindles at Each of the Six Stations



Gear-lapping Machine in which the Work is Rotated between Three Laps

The machine is almost entirely automatic. Means are provided in the control box for regulating automatically the length of time each side of the gear teeth is lapped. The time may be the same for each side or different. The machine can be set to change automatically from lapping one side of the gear teeth to lapping the opposite side. A production of about fifty gears of 10-pitch and 3 inches pitch diameter an hour can be obtained.

Davis & Thompson Crankshaft Drilling Machine

Four oil-holes are drilled in automobile crankshafts from the crankpins through the crank-arms and through the adjacent main bearings, by means of an automatic machine recently built by the Davis & Thompson Co., 6619 W. Mitchell St., Milwaukee, Wis. Each hole is 3/16 inch in diameter by 5 1/4 inches long. The machine gives a production of about sixty crankshafts an hour.

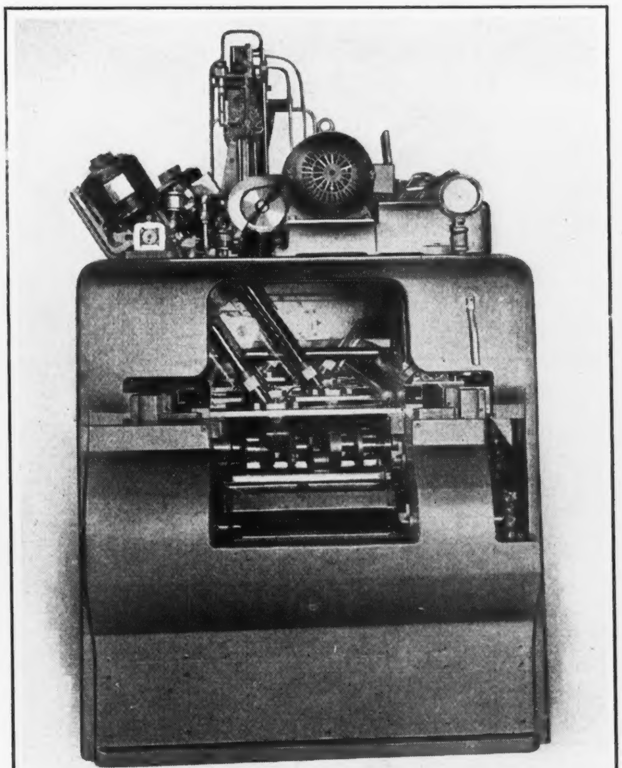
The equipment is of the double-indexing type, the crankshafts being drilled in pairs. There are four drill heads driven by individual motors. Each head carries two drills that operate simultaneously on two crankshafts. The drilling starts as soon as each indexing is completed. While the drilling operation is in progress, the operator removes two crankshafts, standing at the front of the machine, and replaces them. There are twenty-two crankshafts in the machine when it is fully loaded.

During the indexing, the crankshafts are rotated to bring the proper crankpins into position for drilling. Hydraulic cylinders perform the indexing, the machine being arranged with Vickers hydraulic equipment.

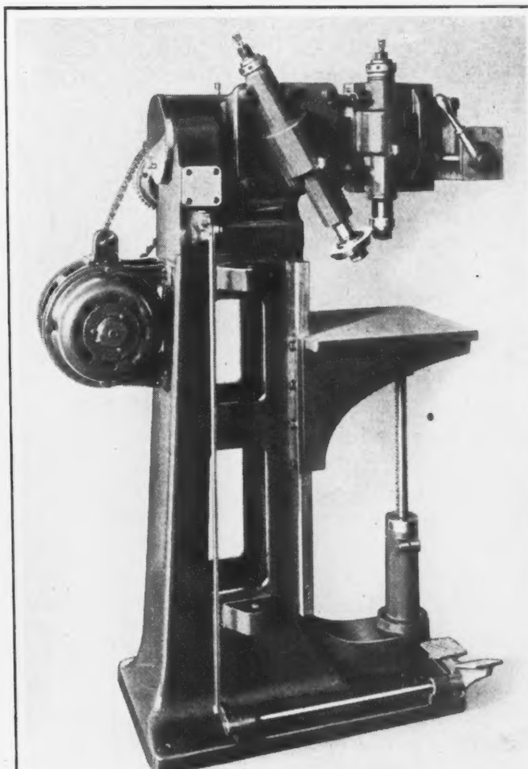
McKinney Vertical Beading and Trimming Machine

Beading operations on round, square, or odd-shaped sheet-metal parts can be performed on the vertical type of machine here illustrated, without the use of fixtures. This equipment is a recent development of the McKinney Tool & Mfg. Co., 1688 Arabella Road, Cleveland, Ohio. Sheet-metal parts can also be trimmed when the production does not warrant the use of dies.

There are two spindles, one of which is held in a fixed angular position. The second spindle is vertical, and can be quickly moved in and out along a horizontal rail to permit the work to be placed between two rolls on the lower ends of the spindles. These rolls can be run at speeds of from 40 to 60 revolutions per minute for beading stock up to No. 18 gage or for trimming stock up to No. 16 gage. The foot-treadle operates a clutch that transmits the drive from the motor to both spindles.



Automatic Machine for Drilling Oil-holes in Automobile Crankshafts



Beading and Trimming Machine for Round, Square, and Odd-shaped Parts

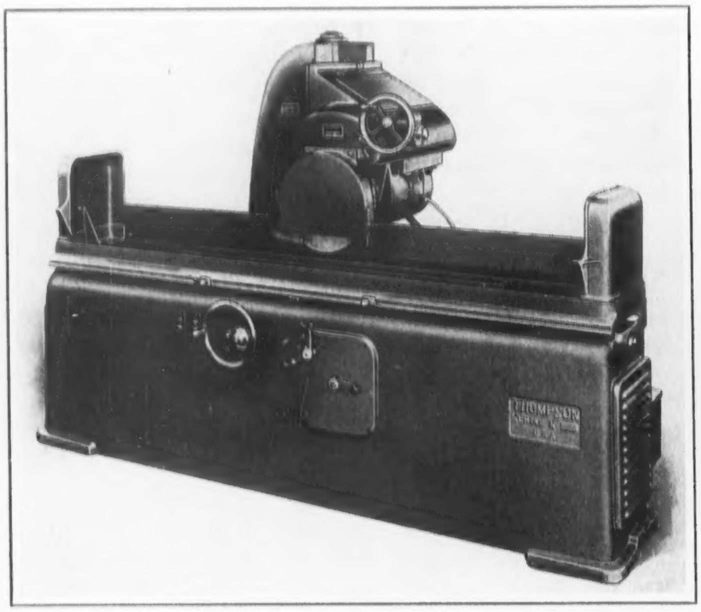


Fig. 1. Thompson Hydraulic Surface Grinding Machine with a Table 60 Inches in Length

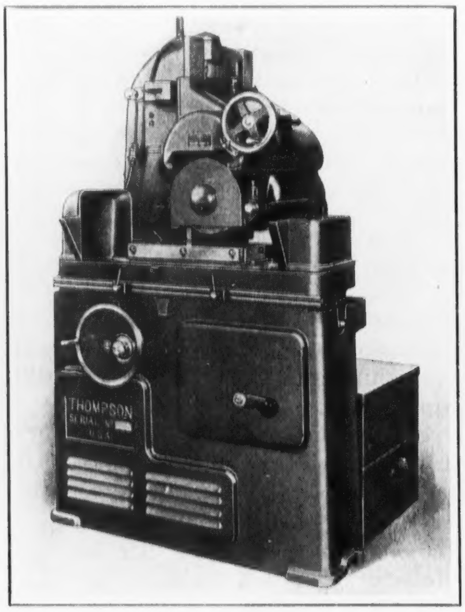


Fig. 2. Hydraulic Surface Grinder Designed for Tool-room Use

Thompson Hydraulic Surface Grinding Machines

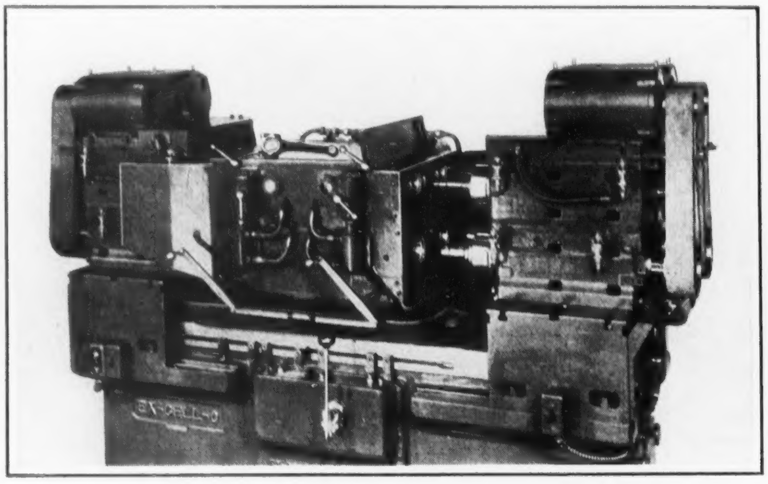
Two hydraulic surface grinding machines recently developed by the Thompson Grinder Co., 1534 W. Main St., Springfield, Ohio, are shown in Figs. 1 and 2. They have a capacity, respectively, of 12 by 16 by 60 inches, and 6 by 12 by 18 inches. These machines complete a line that also includes an 8- by 12- by 24-inch machine of the general appearance shown in Fig. 2, and a 12- by 16- by 40-inch machine, which was described in November, 1931, MACHINERY, page 223.

The operation of these surface grinding machines is entirely hydraulic. All operating functions are controlled from the central valve panel on the front of the cabinet base. The traversing speed of both the table and the grinding wheel head can be easily varied. Reversal of the table is accomplished by dogs, the position of which can be adjusted to suit the work. The reversal is accomplished without shock or dwell, and with an accuracy that permits the grinding of parts having close interferences on the ends.

The traverse of the grinding wheel head can be intermittent, at a variable rate, or continuous in either direction. The motor-on-spindle design is said to eliminate vibration and to deliver maximum power to the grinding wheel. The intermittent cross-feed of the grinding wheel head may be in increments of 1/32 inch up to 65 per cent of the wheel width. A continuous feed or wheel-truing speed can be obtained by operating a lever. There is also a manual feed for use in form or shoulder grinding.

Ex-Cell-O Precision Boring Machine Adapted to Steel

Both the single- and double-end precision boring machines built by the Ex-Cell-O Aircraft & Tool Corporation, 1200 Oakman Blvd., Detroit, Mich., are now equipped to bore steel parts that do not exceed a hardness of 250 Brinell, 36 Scleroscope, or 24 Rockwell, provided that the hardness of the steel is uniform, with no hard spots in different sections, and that the stock to be



Ex-Cell-O Precision Boring Machine which Bores Steel and Bronze

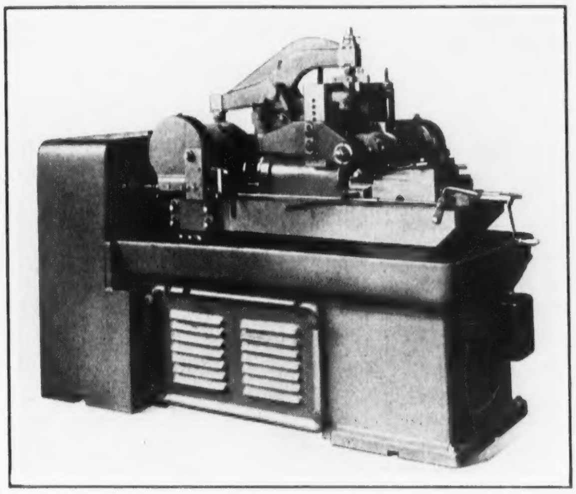
removed is well distributed throughout the bore.

The illustration shows a double-end machine equipped for finish-boring the large and small ends of automobile connecting-rods in one operation. On the large end of the connecting-rods, the material bored is a steel forging, and on the small end, it is a bronze bushing. From 0.018 to 0.020 inch of steel stock is removed, and from 0.008 to 0.010 inch of bronze stock. Two rods are loaded at one end of the fixture while two other rods are being bored at the opposite end, thus eliminating loading time.

Producto-Matic Indexing Milling Machine

An indexing type of milling machine designed for operations in which a number of slots or surfaces are to be milled around the periphery or face of a part is the latest development of the Producto Machine Co., Bridgeport, Conn. The new machine incorporates the usual features of Producto-Matic milling machines, including a fully automatic operation controlled by cams. The cutters are first fed to depth, then forward to finish the cut, and finally are raised clear of the work and returned to the starting position while the work is being indexed.

In addition to the standard features, the machine is equipped with a new type of feed and speed mechanism which eliminates all gears and gives a wide choice of feed and speed changes through V-pulleys and belts. Although the machine illustrated is equipped with a two-spindle indexing head, three- or four-spindle heads can also be supplied. The only manual labor in operating the machine consists of placing the work on arbors or in the work-locating collet.



Producto-Matic which has a Wide Range of Speeds and Feeds through Belts and Pulleys

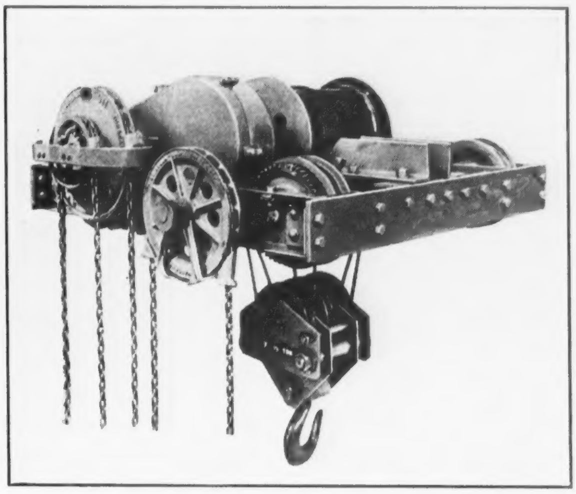
The welded-steel transmission case at the left-hand end of the cabinet base houses the complete transmission for obtaining the cutter feeds and speeds. There are nine separate V-pulleys. Nine feeds and nine speeds are obtainable by merely shifting the V-belts from one pulley step to another. A tension device keeps all belts tightened.

Work up to 4 inches in diameter can be accommodated. The headstock is automatically indexed by a mechanism that is synchronized with the horizontal and vertical movements of the cutter-spindle. The tailstock is usually of a quick-acting design and is adjustable along the bed to suit work of various lengths.

Chisholm-Moore Two-Speed Drum Hoist

A Cyclone two-speed drum hoist, which is a compact combination of the Cyclone wire-rope hoist and a geared structural carriage, has been brought out, by the Chisholm-Moore Hoist Corporation, Tonawanda, N. Y. This hoist is especially intended for installations where the head room is limited and a maximum lift is required.

The hoisting unit is equipped with a dual chain sheave and two pendant hand chains. The larger sheave provides a low-speed ratio for capacity loads, and the smaller sheave a high-speed ratio for light loads. The hoist is built in capacities ranging from 3 to 30 tons, inclusive.



Cyclone Two-speed Wire-rope Drum Hoist Made by the Chisholm-Moore Hoist Corporation

Toledo Dynamic Weigher

An automatic scale for accurately classifying pistons, bearings, valves, cams, and other reciprocating and rotating parts according to their weight is a recent development of the Toledo Precision Devices, Inc., Toledo, Ohio. This scale operates on a new principle, as it weighs the part while in motion, thereby greatly increasing the speed of weighing. The accuracy is said

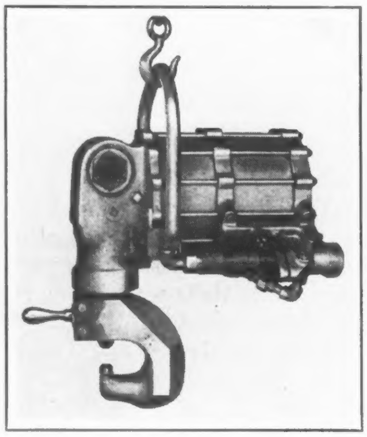
to be such that parts weighing several pounds can be measured within an accuracy of a few grains.

Hanna Riveter with Aluminum Castings

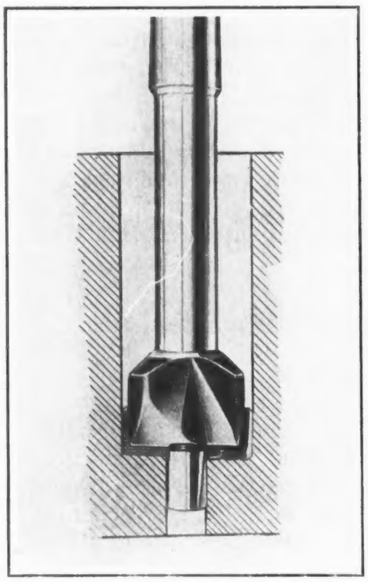
Aluminum alloy castings are used extensively in a yoke-type compression riveter recently developed by the Hanna Engineering Works, 1765 Elston Ave., Chicago, Ill. Other major parts are either hardened and ground alloy steel forgings or heat-treated alloy steel castings. The result is an unusually light and compact riveter for portable use. Although this riveter develops 15 tons pressure between the dies, which is sufficient for heading 5/16-inch diameter cold rivets, the weight is only about 170 pounds.

The mechanism is enclosed and operates in a bath of oil. The yoke can be swiveled 360 degrees around the die axis. It is quickly removable for interchanging with yokes of another shape, reach, and gap. The yoke illustrated has a reach of 3 inches and a gap of 3 inches.

When suspended from a balancer, which provides free vertical movement and which, in turn, is suspended from a crane that provides free horizontal movement, the riveter can be quickly moved from rivet to rivet, even though the rivets are spaced some distance apart.



Fifteen-ton Riveter which Weighs Only 170 Pounds



Two-bladed Counterbore for Deep Holes

Counterbore for Deep Holes

A two-bladed counterbore of the design illustrated has been placed on the market by the O.K. Tool Co., Inc., Shelton, Conn., for boring deep holes. It is intended for bores having a depth as great as or greater than the diameter of the cutter, and is especially suitable for breakdown or roughing operations. Two adjustable cutter blades are inserted in a forged and heat-treated alloy steel body. The blades are interlocked with a pilot which guides the tool through the bore. The body is generously cut away to allow the chips to escape easily.

The cutter blades may be of drop-forged high-speed steel, super-cobalt high-speed steel, Stellite J-metal, or cemented carbide. Tools from 1 1/2 to 6 inches in diameter, inclusive, are available. They are made with Nos. 4 and 5 Morse taper shanks.

Janette Speed Reducers

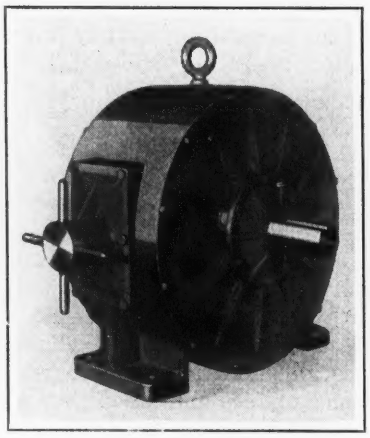
Two new speed reducers, designated Types RW-3 and RW-4, have been added to the line of the Janette Mfg. Co., 556-558 W. Monroe St., Chicago, Ill. These two units make it possible to obtain ratings from 1/3 to 5 horsepower with polyphase alternating current or direct current. Motor speeds of 575, 690, 860, and 1140 revolutions per minute are available. The units are obtainable in twelve standard ratios ranging from 8 to 1 up to 90 to 1.

In general appearance the new speed reducers resemble the one described in October, 1930, MACHINERY, page 160-A. They are of the worm-gear type with a ball-bearing motor bolted direct to the gear housing. The worm is on the extended motor shaft, the outer end of which is supported by a third ball bearing. The slow-speed shaft runs in two tapered roller bearings.

Northern Rotary Hydraulic Pumps

Pumps and motors of a rotary radial piston type for pumping oil in hydraulic systems have been placed on the market by the Northern Pump Co., Minneapolis, Minn., in capacities ranging from 1 gallon to 200 gallons per minute. These pumps develop pressures up to 4000 pounds per square inch. The volume of discharge can be made any amount from nothing to the maximum capacity of the pump, and the discharge can be reversed without stopping the pump or changing the speed or rotation.

Among the machine tool applications for these pumps may be mentioned drilling, grinding, and broaching machines, presses, planers, and variable-speed



Rotary Hydraulic Pump for Machine Tool Applications

drives. The pumps are also intended for high-pressure lubrication systems. Nitralloy is used liberally throughout the construction, in order to prevent wear that might result from dirty oil. Some of the advantages pointed out are sensitive control of the speed, automatic speed increase, and smooth action. There is a hydraulic automatic control.

Langelier Swaging Machines

A swaging machine recently completed by the Langelier Mfg. Co., Providence, R. I., for pointing copper and nickel-silver rods is shown in Fig. 1. The swaging is done preparatory to performing a drawing operation in order to permit threading the stock through a die so that it can be gripped by jaws. Three sets of dies were furnished with the machine to reduce 3/4-, 11/16- and 5/8-inch stock about 0.150 inch per pass for a length of 12 inches. The production averages about 400 ends an hour.

The machine is equipped with Timken bearings and a pressure-feed lubricating system for the operating parts in the head. As a wide range of work sizes is handled, the cover that retains the dies is designed for quick removal. A flywheel brake is furnished for stopping the rotation of the spindle quickly.

Fig. 2 shows a special swaging machine which takes wire from a coil, and straightens, swages, and cuts it to length, the entire process being automatic. Wire up to 0.065 inch in diameter can be handled, and pins up to 3/4 inch long can be swaged and cut off. The production is at the rate of twenty pins a minute.

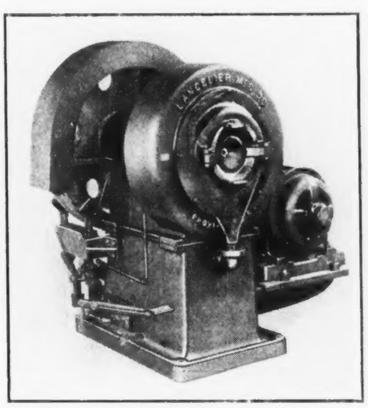


Fig. 1. Swaging Machine for Pointing Rods that are Subsequently to be Drawn

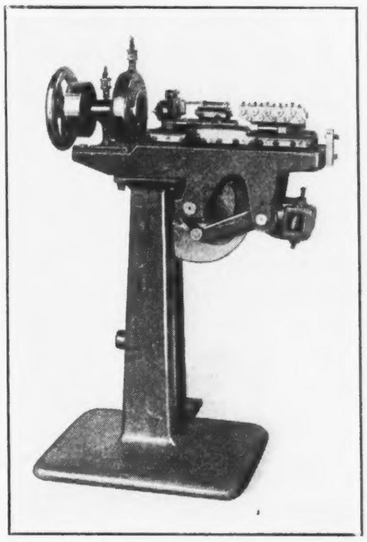


Fig. 2. Automatic Straightening, Swaging, and Shearing Machine

This machine was primarily designed for use in the optical field. It is equipped with a slide on which shearing, feeding, and straightening heads are reciprocated by means of a double cam. The feeding and straightening heads are coupled together and act in unison, while the shearing head is actuated by the feeding head and its travel is controlled by adjustable stops. Shearing is accomplished after swaging.

Federal Open-Back Inclinable Bench Press

A No. 0 bench press has recently been added to the line of open-back, inclinable punch presses made by the Federal Press Co., Elkhart, Ind. This small press has the same general characteristics as the larger machines built by the concern. Besides being made in a bench style, it can be furnished with floor legs. The bench style weighs approximately 350 pounds, and the floor style 500 pounds.

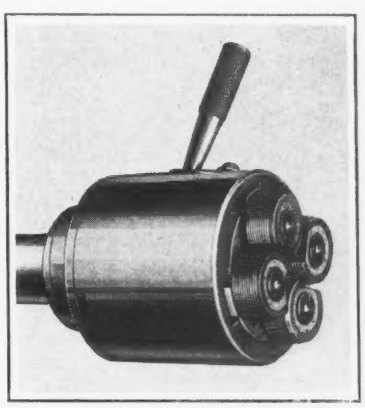
The ram pressure at the bottom of the stroke is approximately 7 tons. The standard stroke is 1 1/4 inches, but a stroke up to 3 inches can be provided. The machine is equipped with a patented non-repeat tripping mechanism, a knock-out bar in the ram and knock-out brackets attached to the frame.

Murchey Non-Rotating Self-Opening Die-Head

A Type RG self-opening die-head with circular chasers has been placed on the market by the Murchey Machine & Tool Co., 951 Porter St., Detroit, Mich., for use on hand screw machines and automatics where the die-head does not revolve. This non-rotating die-head is a companion to the Type RC rotating head described in October, 1932, MACHINERY, page 153. It takes the same chasers, size for size, as well as many other parts. This provides complete interchangeability in shops where one stock of chasers is desirable for use on both live and stationary spindles.

The RG die-head is of the pull-off type, being opened by a self-contained trip which is actuated by retarding the forward movement of the die-head spindle at any point. The opening is positive and instantaneous. An internal trip can be furnished if desired.

The head is closed automatically by a lateral movement when the closing handle engages a stop on the machine. The head can



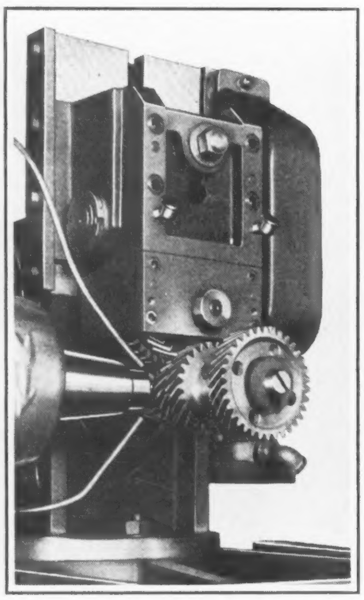
Murchey Non-rotating Self-opening Die-head with Circular Chasers

also be closed by hand. The range of size adjustment makes it possible to cut tight- or loose-fitting threads and to set the chasers to the cutting size after they have been ground. Separate chasers and chaser blocks adapt the die-head for cutting left-hand threads. This die-head is made in sizes ranging from 9/16 inch up to and including 1 1/4 inches in diameter.

Spiral-Gear Work-Head for Gear-Chamfering Machine

Spiral or helical gears can now be chamfered on the Peerless gear-tooth chamfering machine manufactured by the City Machine & Tool Works, E. Third and June Sts., Dayton, Ohio, through the provision of the work-head here shown. This improved Cimatool work-head is also adaptable to spur gears. It can be applied to all No. 3 machines.

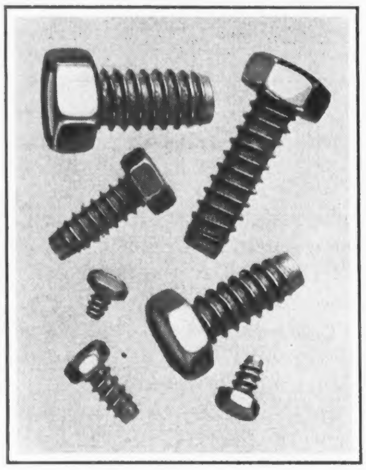
The head can be quickly adjusted to suit gears of various diameters. It has an anti-friction-bearing idler drive. The accompanying illustration shows a tool chamfering a helical automobile transmission gear.



Improved Work-head for Chamfering Teeth of Helical Gears on "Peerless" Machine

Parker-Kalon Self-Tapping Cap-Screws

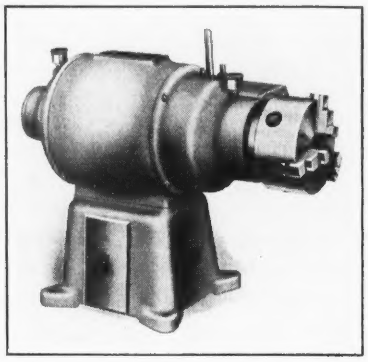
Hexagon-head hardened cap-screws that cut their own thread as they are turned in holes have been added to the line of self-tapping screws made by the Parker-Kalon Corporation, 200 Varick St., New York City. These self-tapping screws can be used in sheet metal from No. 24 gage (0.025 inch thick) up to No. 10 gage (0.140 inch thick); in steel plates and structural shapes up to 1/2 inch thick; and in solid sections of many other materials, such as brass, bronze, aluminum, slate, and ebony asbestos. They are made in a complete range of sizes from No. 6 to 1/2 inch in diameter.



Parker-Kalon Hardened Self-tapping Cap-screws

Speed Lathe for Finishing and Polishing

Two speeds are available in a speed lathe designed by the Schauer Machine Co., 905-907 Broadway, Cincinnati, Ohio, for finishing and polishing rods, tubing, etc. When equipped for operating on direct current of 110 or 220 volts, the speeds are 1350 and 2700 revolutions per minute, and when intended for operation on alternating current of 220 volts, the speeds are 1700 and 3400 revolutions per minute, or 900 and 1800 revolutions per minute, depending upon the size. The motor is of 1/2 horsepower.



Speed Lathe which Accommodates Extra Long Rods and Tubes

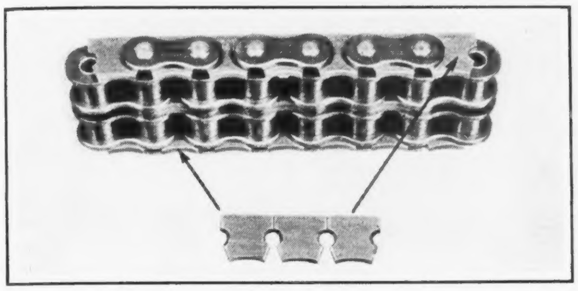
This machine is equipped with an automatic brake designed to permit high rates of production. Current is delivered to the motor by a slight backward push on the hand-lever. When the current is cut off by a forward movement of the lever, the brake is simultaneously applied. The motor is stopped in three seconds when running at high speed and in one-half second when operating at low speed.

An extension in the motor spindle permits 1-inch rods or tubes to be inserted 9 inches into the machine from the face of the chuck. The spindle may be hollow throughout its length. Ball bearings are supplied on both ends of the spindle.

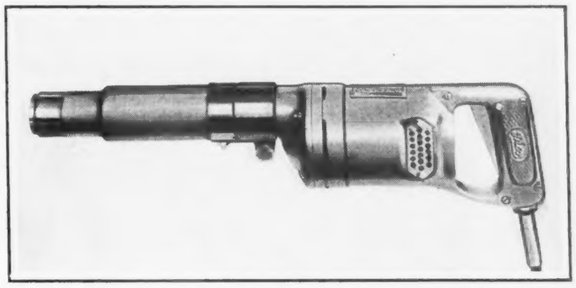
Whitney "Anti-Back-Bend" Chain

The prevention of vibration and whip in roller and silent chain drives is the advantage claimed for a device recently developed by the Whitney Mfg. Co., Hartford, Conn. This device consists of a small wedge-like part, known as a "check link," which is assembled into standard chains at every pitch. The links contact end to end and thus form a continuous stiff backbone throughout the chain length. Three of the links may be seen below the chain in the illustration.

The check links float on the chain rivets and do not interfere with the normal chain-joint



Whitney Chain with Links that Prevent Back Bend and Chain Whip



Thor Portable Electric Combination Drill and Hammer

action. They are particularly advantageous when the load is of a pulsating nature. In non-adjustable chain drives, this device materially increases the life of the chain. Chains with these check links will run on standard sprockets and will interchange with practically every drive where standard flexible chain can be used.

Morrison Motorized Speed Reducing Transmissions

A new line of parallel-drive motorized speed reducing transmissions, in which the output shaft is adjustable to various heights above the base of the unit, is being introduced on the market by the Morrison Machine Co., 1171-1225 Madison Ave., Paterson, N. J. By loosening a clamp screw, the interior of the transmission can be freely rotated, allowing the output spindle to be turned around the axis of the reducer. With this arrangement, the spindle can be placed at any point in the circle of rotation.

These speed reducers can be made in an almost infinite number of ratios and in ratings from small fractional-horsepower sizes up to sizes of 2000 horsepower. The particular model shown has a ratio of 80.6 to 1.

The transmissions are sealed to prevent oil discharge or the entrance of dirt. A glass window permits instant determination of the condition of the oil and its level. The motor in the particular unit illustrated is equipped with a mechanical braking device which is enclosed in a sheet-metal drum.

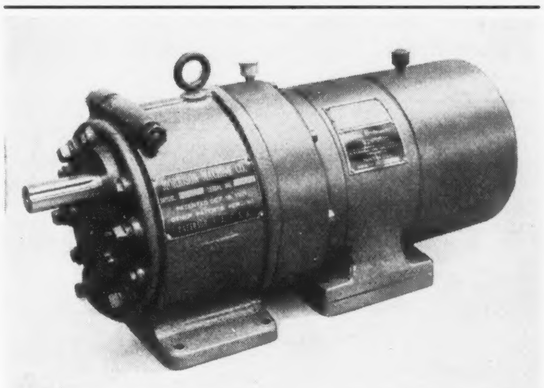
Thor Combination Drill and Hammer

A double-purpose portable electric tool that can be used as both a drill and a hammer has been placed on the market by the Independent Pneumatic Tool Co., 600 W. Jackson Blvd., Chicago, Ill. This tool will chip steel and drive light rivets, as well as drill, chip, and channel concrete, brick, wood, etc. It strikes 3000 blows a minute, has an over-all length of 18 inches, and weighs 16 pounds.

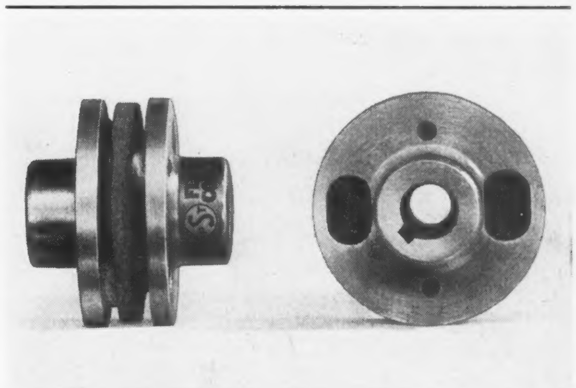
Small Series Flexoid Couplings

A small series has been added to the line of Flexoid industrial couplings made by the Smith Power Transmission Co., 1213 W. Third St., Cleveland, Ohio. The new series is made in two sizes, the smaller of which has a diameter of 2 5/8 inches and is capable of transmitting up to 1 horsepower at 1800 revolutions per minute. The larger size is 3 1/8 inches in diameter and has a capacity for transmitting up to 3 horsepower at 1800 revolutions per minute.

The flanges of the small series couplings are made of aluminum and are connected by socket-head cap-screws. Between the flanges there is a "Thermoid Hardy"



Morrison Speed Reducer with Adjustable Output Shaft



Small Series Flexoid Coupling Made in Two Sizes

flexible fabric disk, there being no metal-to-metal bearing surfaces. The couplings can be used horizontally or vertically.

Photo-Electric Controller

A photo-electric controller that can be used as a limit switch on machine tools, as a guard for power presses or other machines, and for various other applications, has recently been placed on the market by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. The photo-tube or sensitive contact operates a grid glow tube, which, in turn, closes

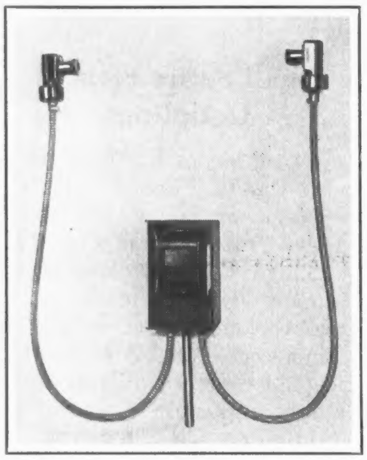
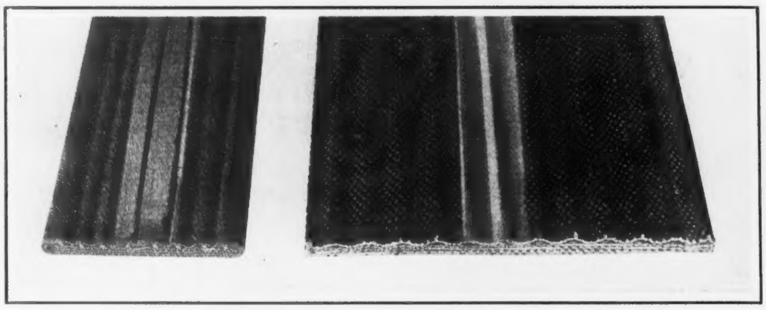


Photo-electric Controller for a Wide Variety of Applications

a contactor capable of starting the desired operation. Units can be supplied for any commercial alternating-current voltage or frequency. Various light sources are available for operating at distances up to 22 feet from the photo-tube.

Gilmer "Kable-Kord" Belt

A belting known as "Kable-Kord" is made by the L. H. Gilmer Co., Tacony, Philadelphia, Pa. The style shown at the left in the illustration is made as an endless belt, while the style shown at the right comes in roll form. Both the endless and roll form belts are available in widths



Endless and Roll-form "Kable-Kord" Belts

from 1 to 12 inches, and the endless belts are made in lengths up to 60 feet. The roll-form belt may be joined by either Clipper or Alligator connectors.

These belts consist of two sets of cords embedded in tough, pliable rubber which is covered by an outer jacket of heavy fabric. One set of cords is intended to hold the inner or load-pulling cords against the pulleys, providing "two belts in one." It is claimed that there is practically no stretch of these belts in use. They are well adapted to short-center drives.

Foote Bros. Motorized Reduction Units

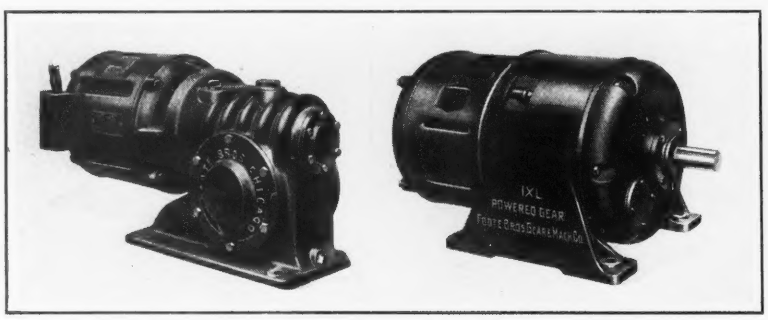
A complete line of motorized reduction units is being introduced to the trade by the Foote Bros. Gear & Machine Co., 5301 S. Western Blvd., Chicago, Ill., under the trade name of "IXL Powered Gear." There are two main divisions of the line—the radiating worm-gear type shown at the left in the illustration and the helical-gear type illustrated at the right. The worm-gear line covers ratios ranging from 4 to 1 up to 60 to 1 in the single reduction style, and up to 3600 to 1 in the double reduction style. This type is made in sizes from 1/2 to 25 horsepower.

The helical type is made in single, double, and triple reduction ratios, providing a range of output speeds from 4 to 850 revolutions per minute. This style has capacities up to 150 horsepower.

Monarch "Centrode Device" and Oval Chuck

Parts of oval, triangular, square, hexagonal, octagonal, and other shapes, with any number of sides up to sixteen, can be turned, bored, and faced on lathes equipped with a "Centrode Device" developed by the Monarch Machine Tool Co., Sidney, Ohio. The sides of the parts machined may be either flat, concave, or convex. Fig. 1 shows the unit applied to a lathe, and Fig. 3 shows typical shapes that have been cut with it.

If the work is irregular in contour and other than round, the Monarch-Keller automatic form-turning machine, described



Foote Bros. Radiating Worm-gear and Helical-gear Motorized Speed Reducers

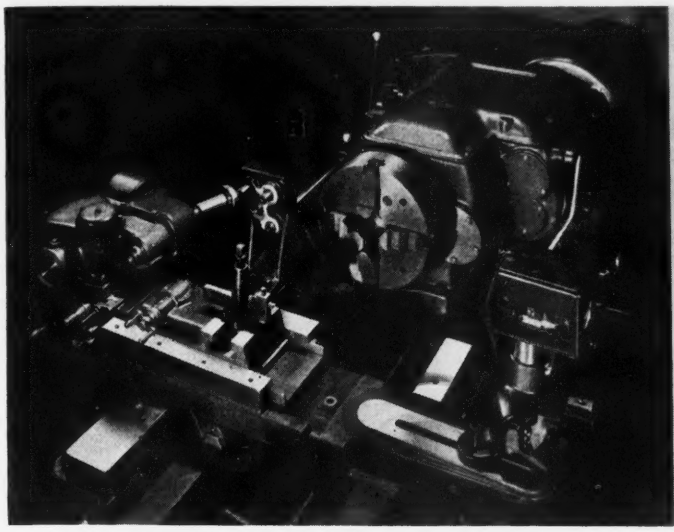


Fig. 1. Monarch "Centrode Device" for Turning, Boring, and Facing Shapes that are not Round

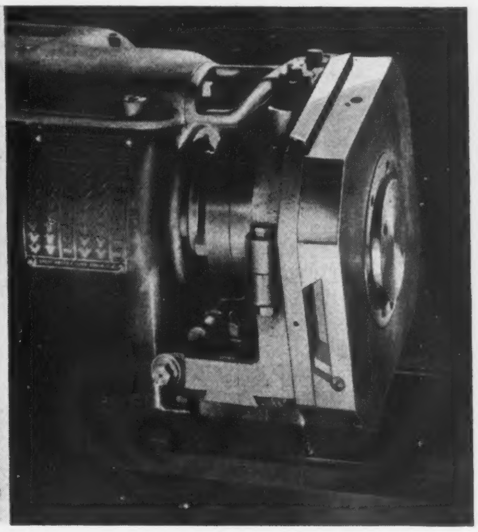


Fig. 2. Oval Chuck for Turning and Boring Elliptical Work

in December, 1930, MACHINERY, page 310, in combination with the "Centrode Device," will turn, bore, or face the contour automatically. The addition of the oval chuck shown in Fig. 2 will permit the machining of many elongated shapes. The "Centrode Device" can be applied to new lathes only, but it is not confined to the form-turning machine.

The "Centrode Device" is supported on the carriage bridge in the same manner as a compound rest. Power is applied from the rear end of the spindle through a universal joint and spiral-bevel pinions to a compound crank on the tool-slide.

In Fig. 2 the oval chuck is shown mounted on a 20-inch lathe equipped with a flanged spindle nose. The front of the oval chuck has a tapered pilot of the same diameter as the spindle nose and a ground locating surface, also of the same diameter, for holding chucks or fixtures. When this chuck is applied to standard lathes, it is possible to produce oval work of straight contours, and when used on the form-turning machine as previously mentioned, it is possible to produce irregular-contour oval work, such as oval-shaped bottle molds, dies, punches, or spinning chucks.

* * *

Industry has a huge stake in present-day political conditions and in present trends of political thought, and our administrators, if they are to protect our industrial operations from some of the dangers that are becoming increasingly threatening, must take a more aggressive position in many of these political situations.—*James D. Mooney, Vice-President, General Motors Corp.*

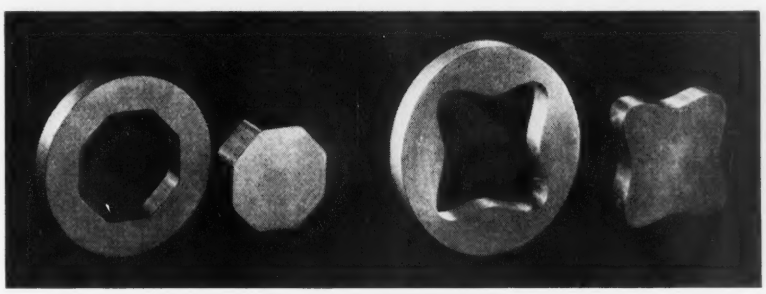


Fig. 3. Typical Pieces Turned and Bored by Means of the "Centrode Device"

Minute Quantity of Lubricant May be Made to Cover a Square Mile

An oil product containing a heat-proof graphitic ingredient has been developed by the Pyroil Co., La Crosse, Wis. This product, known as "Pyroil," is intended to be added in small quantities to regular lubricant, with a view to improving its lubricating qualities. In recent tests made at the University of North Dakota on a main ingredient of Pyroil, it was found that the colloidal (jelly-like) substance was so finely sub-divided that a volume the size of a pea would cover a square mile of surface with a thin, self-lubricating film.

* * *

Electron Tube Detects Cracks in Wire

Flaws and cracks in tungsten or molybdenum wire, copper tubing, and similar materials are detected by a vacuum-tube oscillator recently developed by the General Electric Co., Schenectady, N. Y. The test is based upon the change in electrical resistance of a small section of tubing or wire that has a defect in it; and the equipment will sound a note in a loud speaker and deflect a meter indicator.

NEWS OF THE INDUSTRY

California and Washington

HERB COATS is now Pacific Coast representative for the Stanley Electric Tool Co., New Britain, Conn. Mr. Coats' headquarters are at 576 Monadnock Bldg., San Francisco, Calif. He was formerly associated with the Black & Decker Mfg. Co., and the Van Dorn Electric Tool Co., Towson, Md.

H. S. EMANUELS has been appointed district manager for the Pacific Northwest, of Sterling Electric Motors, Inc., Telegraph Road at Atlantic Blvd., Los Angeles, Calif. Mr. Emanuels' headquarters will be at 1743 First Ave., S., Seattle, Wash., where a stock of Sterling motors and speed reducers will be carried.

Delaware, Pennsylvania and Maryland

ELY C. HUTCHINSON, for the last three years editor-in-chief of *Power*, has been elected president of the Edge Moor Iron Co., Edge Moor, Del., succeeding WILLIAM F. SELLERS. Mr. Hutchinson has had a life-long experience in the iron trades and has held high executive positions in sales, engineering, and administration.

SYNTHANE CORPORATION, Oaks, Pa., manufacturer of Synthane laminated Bakelite, was awarded the "Safety First" plaque and certificate for 1932 by the Montgomery County (Pa.) Manufacturers' Association. This award is made yearly to the manufacturer who has the best safety record for the year in the county.

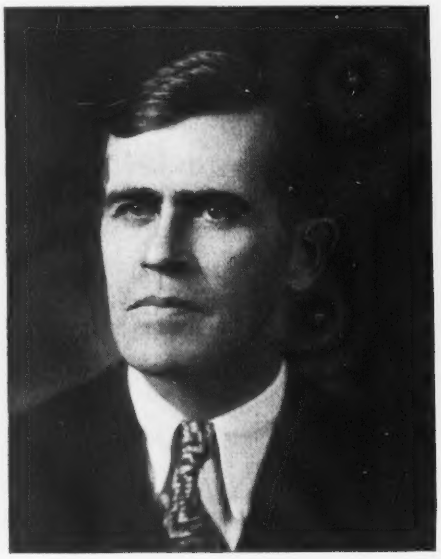
TIMKEN STEEL & TUBE CO., Canton, Ohio, announces the appointment of the Delaware Steel Service, Inc., 1614 Summer St., Philadelphia, Pa., as exclusive representative of the company in the Philadelphia district.

ROBERT D. BLACK has been appointed sales manager of the Black & Decker Mfg. Co., Towson, Md. Mr. Black has previously served as branch manager of sales in the Pennsylvania territory and as advertising and sales promotion manager.

Illinois, Indiana, Missouri and Wisconsin

FOOTE BROS. GEAR & MACHINE CO., 5301 S. Western Blvd., Chicago, Ill., has appointed William E. Peck to succeed Ralph Wirth as representative of the company in the state of Indiana, with the exception of the counties of Lake, Porter, and La Porte, and the Ohio River towns.

GEORGE MYERS, St. Louis Mart Bldg., 12th and Spruce Sts., St. Louis Mo., has been appointed distributor in the St. Louis territory for the heating and ventilating apparatus manufactured by the Buckeye Blower Co., Columbus, Ohio.



Edward P. Connell
Vice-president of the Falk Corporation

F. J. King, New President
Compressed Gas Manufacturers' Assn.

EDWARD P. CONNELL has been appointed a vice-president of the Falk Corporation, Milwaukee, Wis. Mr. Connell became connected with the company in 1913, and in 1924 was made comptroller, which office he will retain in connection with his new appointment.

T. G. SHEDORE has been appointed assistant sales manager of the Four Wheel Drive Sales Co., Clintonville, Wis. Mr. Shedore was formerly manager of the National Accounts Department and has been with the company sixteen years.

New York

HAROLD V. COES, manager of the Industrial Department of Ford, Bacon & Davis, New York City, has been elected president for 1933 of the United Engineering Trustees, Inc., a joint agency of the four founder engineering societies. Mr. Coes succeeds HARRY A. KIDDER, superintendent of motive power of the Interborough Rapid Transit Co. CHARLES A. MEAD, chief engineer of the Division of Bridges and Grade Crossings of the Board of Public Utility Commissions of the State of New Jersey, was chosen first vice-president. R. M. ROOSEVELT, vice-president of the Eagle-Picher Lead Co. of New York, becomes second vice-president. CLIFFORD P. HUNT, vice-president of the Chemical Bank & Trust Co., was re-elected treasurer, and ARTHUR S. TUTTLE, consulting engineer of the Board of Estimate and Apportionment, New York City, assistant treasurer. ALFRED D. FLINN continues as secretary.

F. J. KING, chief engineer of the Linde Air Products Co., 205 E. 42nd St., New York City, was elected president of the Compressed Gas Manufacturers' Association at the annual meeting held at the Waldorf-Astoria Hotel in New York, January 23 and 24.

E. A. LIVINGSTONE has been appointed a sales representative of the Babcock & Wilcox Co. and the Babcock & Wilcox Tube Co., with headquarters at 85 Liberty St., New York City. Mr. Livingstone is engaged in the sale of the seamless steel and alloy tubular products of the Babcock & Wilcox Tube Co., and the special process equipment, including alloy castings and fusion-welded pressure vessels, manufactured by the Babcock & Wilcox Co. For six years prior to his association with the Babcock & Wilcox Co., Mr. Livingstone was sales manager successively of the Los Angeles, Tulsa, and New York offices of the A. O. Smith Corporation. Previous to that, he was with the Romana-Americana, the Roumanian subsidiary of the Standard Oil Co.

UNITED CHROMIUM, INC., New York City, announces that the Supreme Court of the United States, through recent action pertaining to U. S. Patent No. 1,581,-188, granted April 20, 1926, to Dr. Colin G. Fink, covering processes of chromium-plating and the preparation of baths for these processes, has sustained the claims of Dr. Fink that it was his invention, as covered by this patent, which has made possible a practical and commercially available process of chromium-

plating. United Chromium, Inc., holder of the Fink patent, licenses platers to use the chromium-plating process covered by this patent.

GENERAL ELECTRIC Co., Schenectady, N. Y., announces that a new department of the Schenectady Works has been formed which will be known as the motor and generator engineering department. The department will take over all the responsibilities of the former alternating-current and direct-current engineering departments. Earle S. Henningsen has been appointed engineer in charge. Other appointments in the new division are: J. L. Burnham, designing engineer; I. A. Terry, assistant engineer; and A. P. Wood, consulting mechanical engineer.

O. B. J. FRASER, formerly in charge of the International Nickel Co.'s Research Laboratory at Bayonne, N. J., is now located in the Development and Research Department at the company's main offices in New York City, where he will be in charge of developments in the uses of nickel and nickel alloys in various industries. NORMAN B. PILLING, formerly in charge of metallurgical research, has been placed in charge of the Research Laboratory.

CRANE-SCHIEFER-OWENS, INC., with offices in Buffalo, Syracuse, and Rochester, N. Y., have been appointed representatives for the sale of the grinding, lapping, and balancing machines manufactured by the Norton Co., Worcester, Mass. C. H. Hill, who has been associated with the sale and demonstration of Norton machines in this territory for many years, is now connected with Crane-Schiefer-Owens, Inc.

RAYMOND L. COLLIER, for a number of years assistant managing director of the Steel Founders' Society of America, 420 Lexington Ave., New York City, was recently appointed managing director of that organization to succeed GRANVILLE P. ROGERS, who has become affiliated with the Paper Cup Manufacturers' Institute of New York City.

C. B. BOYNE has been appointed assistant to the president of the Ludlum Steel Co., Watervliet, N. Y., succeeding C. B. TEMPLETON. Mr. Templeton is now assistant to the vice-president in charge of sales. Mr. Boyne was formerly assistant manager of sales. He will now be located at the executive offices in Watervliet.

C. B. TEMPLETON, formerly assistant to the president of the Ludlum Steel Co., Watervliet, N. Y., has been appointed assistant to the vice-president in charge of sales. In addition to other duties, Mr. Templeton will have charge of all the advertising activity of the company.

RUSSELL, BURDSALL & WARD BOLT & NUT Co., Port Chester, N. Y., has been licensed by the Dardelet Threadlock Corporation, 120 Broadway, New York City, to manufacture and sell "Rivet-Bolts" and other bolts and nuts with the Dardelet self-locking thread.

H. J. FRENCH, in charge of alloy-steel and cast-iron development for the International Nickel Co., Inc., New York City, addressed the Detroit Chapter of the American Society for Steel Treating, February 13, on "Some Aspects of the Hardening of Steel."

JOHN R. HEWETT, editor of the *General Electric Review* for nearly twenty years, has been retired because of ill health.

Ohio and Michigan

OSTER MFG. Co., Cleveland, Ohio, manufacturer of pipe and bolt threading equipment, has just celebrated its fortieth anniversary, the occasion being observed by a gathering of officers and employes at the home of Arthur S. Gould, secretary of the company, as well as of the Williams Tool Corporation, Erie, Pa., which was merged with the Oster Mfg. Co. three years ago. The combination of the two companies will be known in the future as OSTER-WILLIAMS, Cleveland, Ohio.

APEX ELECTRICAL MFG. Co., Cleveland, Ohio, has appointed J. E. Gregory sales engineer. Mr. Gregory has some fifteen years' experience in the motor industry. The company is developing the sales organization of its motor division, which has recently been moved into a new plant, giving additional engineering and production facilities. The company has manufactured fractional horsepower motors for twelve years.

NATIONAL ACME Co., Cleveland, Ohio, has called our attention to the fact that the company purchasing the sixteen National Acme screw machines referred to in February MACHINERY has made an installation of the Chronolog in connection with these machines in order to secure the production control that the Chronolog makes possible.

CADILLAC MACHINERY Co., 623 Fisher Bldg., Detroit, Mich., has been appointed exclusive dealer in the Detroit territory by the Bryant Machinery & Engineering Co., Chicago, Ill., for the following lines of machinery: Ohio horizontal boring, drilling, and milling machines; Cleereman drilling machines; and Imperial arc welders. The Cadillac Machinery Co. also handles Boye & Emmes engine lathes in the Detroit district. The Bryant Machinery & Engineering Co. is distributor for all these lines of machine tools.

DAVIS & THOMPSON Co., 6619 West Mitchell St., Milwaukee, has appointed the Riordan Machinery Co., 213 Curtis Bldg., W. Grand Blvd., at Hamilton, Detroit, Mich., representative of the company in the Detroit district. The Davis RotoMatic high-production machinery was previously handled in the Detroit district by the Cadillac Machinery Co.

HOWARD A. HOLMES has become connected with the sales department of the Inland Steel Co. at the company's Detroit, Mich., office. During the past year, Mr. Holmes has been assistant district sales manager of the Weirton Steel Co., in Chicago.

Overhead Cranes Built from Aluminum

In building overhead cranes from aluminum, a change in the conventional design used for steel cranes can advantageously be made. When steel is used, a box-girder construction is usually employed; when aluminum is used, a truss-type girder should be employed. The reason for this is that in the box-girder crane more material is employed than is necessary from the design standpoint; but it is cheaper to use box-girder construction for steel-girder cranes, because the additional labor cost in a truss-type crane built from steel would be greater than the amount saved in the material. Steel, therefore, being a low-priced material, calls for a box-girder type crane.

When aluminum is used, it is more economical to employ a truss design, because the additional cost of labor is more than offset by the saving in the more expensive material. Furthermore, the main reason for using aluminum in crane construction is to reduce the dead weight of the crane structure. The use of less material will, of course, aid in accomplishing this. A truss-type crane can be designed so that it will have practically the same rigidity as a box-girder crane, and, at the same time, a material saving in weight can be effected.

* * *

Annual National Metal Congress and Exposition

The fifteenth annual National Metal Congress and Exposition will be held in Detroit, October 2 to 6. The Board of Directors of the American Society for Steel Treating unanimously made this decision at their meeting in Cleveland on January 20 and 21. Invitations to participate in the Congress have already been accepted by the iron and steel and metals divisions of the American Institute of Mining and Metallurgical Engineers, the American Welding Society, and the Wire Association. The list of cooperating societies will probably include all the organizations regularly meeting with the Congress.

NEW BOOKS AND PUBLICATIONS

ENGINEERING SHOP PRACTICE. By Orlan William Boston. 539 pages, 6 by 9 inches. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York City. Price, $5.50 net.

This is the first volume of a work that will be published in two parts dealing with engineering shop practice. The text is the result of the author's experience in teaching the subject during the last ten years at the University of Michigan. A knowledge of the materials and engineering principles involved in manufacture is stressed, and the relation and desired cooperation between various managerial officers are outlined.

The present volume consists of eight chapters covering basic machining processes, such as lathe, planer, and shaper work, milling, sawing, drilling, boring, reaming, and threading. The second volume will contain material on additional machining processes. The text is meant primarily for classroom assignments and discussions; it is supplemented by a laboratory manual.

EFFECT OF DEPRESSED BUSINESS CONDITIONS ON CREDIT TERMS. 10 pages, 8½ by 11 inches. Published by the Policyholders Service Bureau of the Metropolitan Life Insurance Co., 1 Madison Ave., New York City.

This book is the result of a survey made by the Bureau to determine what changes, if any, have taken place in the credit terms commonly used by manufacturers and wholesalers, and in the retail installment field. It contains an analysis of the experience of more than seventy-five companies in a number of different industries.

MECHANICAL WORLD ELECTRICAL POCKET-BOOK (1933). 337 pages, 4 by 6 inches. Published by Emmott & Co., Ltd., 31 King St., W., Manchester, England. Price, 1/6 net.

This is the twenty-sixth edition of a well-known little handbook containing a collection of electrical engineering notes, rules, tables, and data. In the present edition many suggestions received from users have been incorporated in order to bring the information up to date. The material covers the same general scope as in previous editions.

SELECTED PAPERS FROM PURDUE UNIVERSITY AUTOMOTIVE SERVICE CONFERENCES OF 1929-1930-1932. Compiled and edited by H. M. Jacklin. 121 pages, 6 by 9 inches. Published by Purdue University, Lafayette, Ind., as Extension Series No. 29 of the Engineering Extension Department.

AN EXPERIMENTAL INVESTIGATION OF THE FRICTION OF SCREW THREADS. By Clarence W. Ham and David G. Ryan. 62 pages, 6 by 9 inches. Published by the University of Illinois, Urbana, Ill., as Bulletin No. 247 of the Engineering Experiment Station. Price, 35 cents.

A TEST OF THE DURABILITY OF SIGNAL-RELAY CONTACTS. By Everett E. King. 18 pages, 6 by 9 inches. Published by the University of Illinois, Urbana, Ill., as Bulletin No. 250 of the Engineering Experiment Station. Price, 10 cents.

WELDING WITH MANUFACTURED, NATURAL, AND MIXED GAS. By H. H. Lurie. 116 pages, 6 by 9 inches. Published by Purdue University, Lafayette, Ind., as Research Series No. 41 of the Engineering Experiment Station.

METHODS OF ORGANIZING AND CONDUCTING INDUSTRIAL SAFETY CONTESTS. 20 pages, 8 by 10½ inches. Published by the Policyholders Service Bureau of the Metropolitan Life Insurance Co., 1 Madison Ave., New York City.

THE CHEMICAL RESISTANCE OF RUBBER AS AN ENGINEERING MATERIAL. By H. E. Fritz and J. R. Hoover. 17 pages, 5½ by 8½ inches. Published by the B. F. Goodrich Rubber Co., Akron, Ohio.

DOES INDUSTRY NEED A NATIONAL STANDARDIZATION AGENCY? 20 pages, 5 by 7 inches. Published by the American Standards Association, 29 W. 39th St., New York City.

THE VALUATION OF PATENTS. By George Hart Morse. 20 pages, 6 by 9 inches. Distributed by the author, P. O. Box 271, Washington, D. C. Price 25 cents, postpaid.

COMING EVENTS

MARCH 1-2—Fourth Annual Greater New York Safety Conference to be held at the Hotel Pennsylvania, New York, under the auspices of the Metropolitan Chapter of the American Society of Safety Engineers. Further information can be obtained from Safety Conference Headquarters, 9 E. 41st St., New York City.

MARCH 7-10—Third Packaging Exposition at the Hotel Pennsylvania, New York, under the auspices of the American Management Association, 225 W. 34th St., New York City.

MARCH 8—Regional meeting of the American Society for Testing Materials in New York City. C. L. Warwick, secretary-treasurer, 1315 Spruce St., Philadelphia, Pa.

MARCH 22—Annual meeting of the Gray Iron Institute at Cleveland, Ohio; headquarters, Hotel Cleveland. Arthur J. Tuscany, manager, 4300 Euclid Ave., Cleveland, Ohio.

MARCH 22-24—Conference on Re-Engineering for Economical Manufacture to be held at the Case School of Applied Science, Cleveland, Ohio. For further information, address Professor E. S. Ault, Case School of Applied Science, Cleveland.

MARCH 30—Annual Machine Shop Practice Meeting of the Chicago Section of the American Society of Mechanical Engineers at the Auditorium of the Engineering Building, Chicago, Ill. Chairman of the meeting, C. B. Cole, president of the Tool Equipment Sales Co., 4625 Fulton St., Chicago, Ill.

APRIL 26-28—Twentieth National Foreign Trade Convention to be held at Pittsburgh, Pa. Eugene P. Thomas, secretary, 1 Hanover Square, New York City.

MAY 4-6—Annual meeting of the American Gear Manufacturers' Association at Wilkinsburg, Pa. J. C. McQuiston, manager-secretary, First National Bank Bldg., Wilkinsburg, Pa.

JUNE 19-23—Annual convention and exposition of the American Foundrymen's Association at the Hotel Stevens, Chicago, Ill. C. E. Hoyt, executive secretary-treasurer, 222 W. Adams St., Chicago, Ill.

JUNE 25-30—Sixth Midwest Engineering and Power Exposition in the Coliseum, Chicago. Exposition headquarters, 308 W. Washington St., Chicago, Ill.

JUNE 26-29—Semi-annual meeting of the American Society of Mechanical Engineers at the Hotel Stevens, Chicago, Ill. Calvin W. Rice, secretary, 29 W. 39th St., New York City.

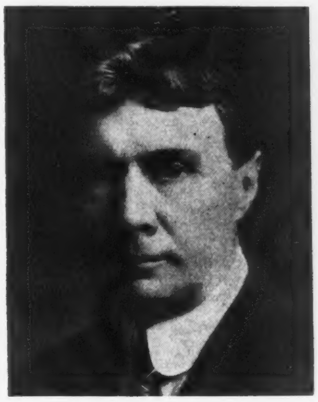
JUNE 26-30—Annual meeting of the American Society for Testing Materials at the Hotel Stevens, Chicago, Ill. C. L. Warwick, secretary-treasurer, 1315 Spruce St., Philadelphia, Pa.

OBITUARIES

Clarence E. Whitney

Clarence E. Whitney, president of the Whitney Mfg. Co., and secretary-treasurer of the Hanson-Whitney Machine Co., Hartford, Conn., died suddenly at his home in Hartford, January 22, at the age of sixty-three.

Mr. Whitney was one of Hartford's most prominent manufacturers. He was the son of Amos Whitney, who was a pioneer in the machine tool manufacturing industry and one of the founders of the Pratt & Whitney Co. After having graduated from the Massachusetts Institute of Technology in 1891, Mr. Whitney went to Germany to study industrial methods in that country, and then entered the employ of the Pratt & Whitney Co. In 1894, he left this firm and became one of the founders of the Hartford Faience Co., of which he was president at the time of his death. Two years later he founded the Whitney Mfg. Co. In 1919, he founded, with the late B. M. W. Hanson, the Hanson-Whitney Machine Co.; and in 1920, the Hanson Tap & Gage Co.



Clarence E. Whitney

For many years, Mr. Whitney was a director of the National Association of Manufacturers, and in 1904 he aided in the organization of the Manufacturers' Association of Hartford County, of which he has since been a member of the board of managers. With other Hartford manufacturers, he organized, in 1910, the Liberty Street Realty Co. for the construction of moderate-priced homes for workmen to be sold on terms that would enable men of small income to acquire a home. He also took an active interest in many civic projects in Hartford.

Mr. Whitney is survived by his wife, two sons, two daughters, and six grandchildren.

Arthur L. Garford

Arthur L. Garford, president of the Cleveland Automatic Machine Co., died suddenly at his home in Elyria, Ohio, January 23, at the age of seventy-four years. In addition to his interest in the Cleveland Automatic Machine Co., Mr. Garford was prominent in several industries in Elyria—among others the Perry-Fay Mfg. Co., of which he was a director. Mr. Garford engaged in the bicycle industry in its early days and gained prominence as a manufacturer of bicycle saddles and parts. Later, he engaged in the manufacture of automobile parts also.

Marking Plastic Materials by Branding

Parts molded from plastic materials, such as Bakelite, Durez, celluloid, etc., usually have scale graduations, names, or other required notations molded on their surfaces when they come from the molds. These markings can be produced by either raised or engraved characters in the cavity of the mold.

In some cases, however, it is necessary to mark parts made from plastic materials after they have been molded. For such work, engraving by the pantograph or some similar process, using a revolving engraving tool, is usually considered the best method of producing clean-cut characters. The engraving process, however, is rather slow and expensive for small, molded parts.

When appearance is of little account, as in the case of part numbers for identification purposes, the numbers can be stamped on the pieces. The objection to using stamps is that they do not produce the clean-cut characters desired for most purposes, especially in cases where the impressions are to be filled with white enamel or gilt. There are also many parts that are too fragile to be stamped. If, however, the stamps are used hot, that is, as branding irons, very satisfactory results can be obtained. Success with this method depends largely on heating the stamp to the correct temperature and applying it in the proper manner. Some experimental work must be done in working out these details.

The stamps or punches used are of the ordinary type, except that where "filling" is to be used, very little taper is given to the flanks of the lettering. For small quantities, brass dies are satisfactory, although steel is preferable, since most molded plastics have an abrasive action on the stamp. The best method of heating the stamp is by means of an electric element. In some cases, an electric soldering iron can be used for this purpose by removing the soldering bit and inserting the stamp. The heating element, together with the stamp, can be supported in a hand press.

If the area covered by the stamping extends over one-half square inch, a floating or equalizing mounting for the stamp is necessary to keep the depth of the impression uniform. It is usually more convenient to allow the pad or bolster to float instead of the stamp. If the pad is pivoted in the middle, so that it is allowed to tilt 5 degrees in any direction, satisfactory results will be obtained. For very light work, a sheet of rubber about 1/4 inch thick can be used to equalize the pressure.

The temperature for branding varies considerably, both with the size of the characters and the class of material. Ordinary moldings utilizing a wood filler are far easier to brand than moldings having an asbestos base, or than sheet materials consisting of laminated sheets of paper or cloth, impregnated with synthetic plastic materials.

If the temperature is too high, the plastic material is partially carbonized and exhibits a white fringe all around the impression. On the other hand, if the temperature is too low, the impressions will be shallow, and there will be a tendency for them to split at the sides when too great pressure is employed.

The temperature must be controlled within plus or minus 10 degrees F. in order to obtain clear-cut impressions. Control of the pressure is not quite so important, although spring pressure pads are sometimes useful. In some cases, it is possible to mark celluloid with cold punches, provided the sheet material is first softened by immersion in boiling water.

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The Cheerful Side

Roots-Connersville-Wilbraham, Connersville, Ind., recently shipped seven large gas pumps of the rotary positive type to plants of the Liquid Carbonic Corporation located at Boston, Mass., Norfolk, Va., Buffalo, N. Y., Philadelphia, Pa., Atlanta, Ga., and Dallas, Texas. In addition, the Liquid Carbonic Corporation has placed an order for a 20- by 24-inch R-C-W heavy-duty special chemical gas pump for its new plant on Long Island.

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More than 350 billion incandescent lamps are sold in this country every year. Yet all these lamps, if they were turned on together, would illuminate less than one square mile to sunshine intensity, according to a statement made by the illuminating engineers of the Westinghouse Lamp Co.

Classified Contents of this Number